South Pacific Ocean

Directory.

Library of

Gift of

THE
SOUTH PACIFIC
OCEAN
shewing the
SURFACE CURRENTS
and
Ice drifts
Currents variable and uncertain
Tropic of Capricorn
Equator
Icebergs seen in 1867 hereabouts
Line of Freezing in Air 32° Feb.y & Jan.y & Feb.y
Line of Freezing 32° F.h in July & August
ANTARCTIC DRIFT CURRENT
PERUVIAN CURRENT
CHILI CURRENT
CAPE HORN CURRENT
AUSTRALIA
TASMAN SEA
NEW ZEALAND
CHILI
LA PLATA
PATAGONIA
BOLIVIA
PERU
COLOMBIA
ECUADOR
Phoenix Islands
Ellice Islands
Marquesas Is.s
LOW ARCHIPELAGO
Samoa or Navigator Is.s
Friendly Islands
Fiji Islands
Solomon Is.s
Caroline Islands
Marshall Islands
PAPUA OR NEW GUINEA
BORNEO
Chatham Is.s
Falkland Is.s
South Shetlands
Antipodes Is.s
Auckland Is.
Campbell I.
Macquarie I.
Douglas I.
Galapagos Is.s
Juan Fernandez
Easter I.
Sala-y Gomez
Ice Bergs seen from Jan.y Mar.h
April June
July Sept.r
Oct.r Dec.r
R.H. LAURIE, N.o 35, MINORIES, LONDON

T. Andrews
1895

A

DIRECTORY

FOR THE NAVIGATION OF THE

SOUTH PACIFIC OCEAN;

WITH DESCRIPTIONS OF ITS

COASTS, ISLANDS, ETC.,

FROM THE

STRAIT OF MAGALHAENS TO PANAMA,

AND THOSE OF

NEW ZEALAND, AUSTRALIA, ETC.;

ITS WINDS, CURRENTS, AND PASSAGES.

PEABODY MUSEUM OF SALEM

FIFTH EDITION.

BY ALEXANDER GEORGE FINDLAY, F.R.G.S.,
Honorary Member of the Società Geografica Italiana.

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PREFACE TO THE FIRST EDITION.

THE title of the present work is sufficiently indicative of its character, but a few words may be said as to its claims to confidence.

The mariner requires information of a specific nature respecting the countries he is interested in. For the Pacific, this information must be sought for in an immense mass of materials—the observations of a long series of authors on a vast variety of topics. The labour of seeking it among such a number of volumes as must be possessed to gain a complete insight into its navigation, must also annihilate their utility in a practical sense; and this evil is increased by the variety of languages in which they are composed. It is not very probable, moreover, even if it were desirable, that many of the most valuable works could be procured, as their rarity and cost have precluded them from general circulation. Thus the number of volumes exclusively applied to the description and narratives in the Pacific Ocean is above one hundred, many of them of considerable bulk, and containing particulars in every department of literature. Those which less directly refer to our present subject, but still contain indispensable information, would amount to more than double that number. It is unlikely that a ship-master could either possess or properly avail himself of such a library.

It was to remedy this evil, to supply this want, that this work was undertaken; to draw up, for the use of the mariner, a hydrographical memoir, in a comprehensive and accessible form, from the mine of materials contained in the volumes which have been written on the Pacific; and in doing this, it is believed that no source of authentic information has been overlooked, but the whole range of works have been carefully referred to—a work of very considerable labour.

Although it directly refers to the navigation of the Pacific Ocean, it will be found that it offers sufficient interest to the general reader, in the varied features of the countries it describes, as it has been deemed advisable to attach to each division some brief descriptions in connexion with the hydrographical detail, and thus increase its utility.

By the references which are made throughout to the authorities from which the various information is derived—a plan which, in general, has been scrupulously adhered to—our work may be received in the light of an arranged index to the literature of the Pacific Ocean. Where extracts have been made, referring specially to navigation, they are given in the words of their authors, as any ambiguity which might arise from modifying them would, perhaps, impair their utility. The same may be said of those directions which have been adapted from any other language.

In many cases our difficulty has been one of selection—numerous and apparently conflicting statements being frequently met with; these, it is hoped, are fairly alluded to. But in the majority of instances in the remoter portions of the ocean, the particulars are scanty, and often made up from many sources. In the extent of description, we have been guided by the comparative importance of places; not forgetting, however, that many, now unnoticed and almost unknown, may soon spring into consequence in this era of progress in the great ocean.

The plan of the work needs little explanation: it has been separated into two parts—the first referring to its continental shores, the second, to its islands: the latter also contains the observations on its physical phenomena, and general sailing directions.

A. G. FINDLAY.

The first edition of this work, to which the foregoing preface was attached, differed in its arrangement to the present volume. The former work described the whole of the Pacific for the first time—the first volume related to the coasts of the North and South Pacific; the second to the islands and archipelagoes scattered over the ocean between them.

This book refers only to the South Pacific, its coasts and islands, the North Pacific being described in a similar work, on the same arrangement. This has been thought to be more convenient to the larger proportion of voyages which are made from East to West, or *vice versâ*, rather than from one ocean to the other.

The matter is chiefly derived from the former editions, but carefully subjected to the additional knowledge which the lapse of time has brought within reach. In many cases this has been very considerable, and in no portion of the world has investigation been more vigorously or carefully pursued in the last few years, eminent for their progress in most branches of inquiry, than has been shown in the hydrography of the Pacific. It is believed that no source of information has been overlooked, and that our work represents accurately our present knowledge of the Great South Sea.

In the first edition each work quoted, or authority, was carefully referred to by foot notes. That work having done good service, it was considered unnecessary to repeat them in the present, but to the numerous sources to which we are indebted for the improvement of this book we tender our acknowledgment.

London, June 30th, 1884.

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THE

SOUTH PACIFIC OCEAN.

SECTION I.

INTRODUCTION.

The existence of the great ocean to the westward of America soon became known to the European discoverers and conquerors of the New World. The Spaniards under Columbus, in 1502, had pushed their explorations along the northern coast of South America to the isthmus, and there established their power. Eleven years later, Basco Nuñez de Balboa, the Spanish governor of Darien, guided by native information, headed an expedition, among whom was Francisco Pizarro, and marched across the isthmus. He arrested their progress at the foot of a hill, from the summit of which he was told that this new sea was visible, and ascending alone, he fell on his knees and thanked heaven for having bestowed on him the honour of being the first European that beheld the sea beyond America. This was on September 25th, 1513. He subsequently took possession of it in the name of the King of Castile and Leon.

It was called the Mar del Zur, the *South Sea*, because it was relatively so to the portion of coast from which it was first seen.

It was called *Pacific* by Fernando de Magalhaens, the first circumnavigator. This could only refer to the tropical portion, as Magalhaens sailed with great storms (*con gran tormenta*) till December, 1521, when they found themselves in lat. 32° 20′ S.

Thus the terms South Sea or Pacific Ocean are neither of them justly appropriate, seeing that it is neither more South nor more pacific than any other. But the names are recognized.

Maltè-Brun, who has been followed by many others, has proposed the name *Great Ocean*, or rather that of *Oceanica;* but as all authors who have especially written on the subject have used one or other of the former names, they ought to be adopted. Therefore that now best known, the *Pacific Ocean*, is the one to be used.

We would wish in the ensuing prefatory remarks to briefly enumerate the principal authorities upon which the present state of Pacific hydrography is based. And in so doing we ought really to commence at an era which would include many noble names—the leaders of that band of navigators who have added another world within the range of comparatively modern times to the knowledge of civilized men.

But as the plan of our work does not admit of mere historical detail, we must here pass over the earlier discoverers; they will be found alluded to in the subsequent pages. The reader who is interested in the progress of discovery will find the subject exhausted in the admirable work, "A Chronological History of Voyages in the South Sea," by Admiral James Burney.

We therefore commence at the period when modern science, that is, as at present understood, was first brought to bear on Pacific hydrography. This was in the famous voyage of Capt. James Cook. We shall, for convenience, enumerate the principal points in the different expeditions in a chronological order, commencing with his.

Capt. *James Cook* is justly placed at the head of English navigators, a pre-eminence which proudly overlooks all others. Perhaps there never was a narrative which attracted so much attention, or has dwelt so much in the memory of a nation, as the accounts of his voyages and his remarkable death. It is in the Pacific Ocean that his discoveries have elevated his fame, and prior to his expeditions it might be said that one-half of the oceans of the world were unknown to Europe. Cook, as is well known, was the son of an agricultural labourer, born at Marton, in Cleveland, Yorkshire, October 27, 1728. His first nautical exploits were as an apprentice on board a Newcastle collier. In 1755 he entered the navy, on board the *Eagle*, the command of which was soon taken by Sir Hugh Palliser, who first recognized Cook's merits, a fact which ought not to be forgotten. Cook afterwards perpetuated his gratitude by naming the South extremity of North Island, New Zealand, after him, the well-known S.E. cape of Cook's Strait; and also some islands in the Low Archipelago. His first public service was the survey of the River St. Lawrence, and piloting the boats to the attack of Montmorency and the heights of Abraham, at Quebec. His surveys in these parts were published by the house from which the present work issues. Gaining the esteem of his superiors, as a master in the navy, he was selected, on the recommendation of his friends, Lord Colville and Sir Hugh Palliser, by Sir Edward Hawke, to take the command of a scientific expedition to the South Seas; this was in

1767. The Royal Society observed that it would be greatly to the advancement of astronomical and geographical science to send persons into some part of the South Sea, to observe the transit of the planet Venus over the sun's disc, which would happen in the year 1769, and that the islands called the Marquesas de Mendoça, or those of Rotterdam, or Amsterdam, were the fittest places for that purpose. This resolution having been laid before the young king, George III., he directed that the *Endeavour* (a collier of 370 tons) should be fitted out, and the command given to Cook, then made a lieutenant.

This was while the expedition, also sent out by George III., under Wallis and Carteret, was still at sea; but during the preparation Wallis returned, and then his discovery of King George's Island (Tahiti) was chosen as the best locality for the observations. Lieut. Cook was accompanied by Mr. Green, as astronomer; and Mr. (afterwards Sir Joseph) Banks, a gentleman of fortune, and Dr. Solander, as naturalists, with proper assistants. The *Endeavour* left Plymouth August 26, 1768, and passed Cape Horn January 26th following, reaching Tahiti April 12, 1769. The transit was satisfactorily observed at the observatory on the well-known Point Venus, an account of which is given in the Philosophical Transactions, vol. lvi, part ii, p. 397, *et seq.* Quitting Tahiti, they reached Poverty Bay, New Zealand, on Friday, October 7, 1769. New Zealand at this time was little known, and most of the crew thought they had come on the *terra australis incognita*, then the great problem of geography. Having sailed all round the islands, and determined their insular character, the separation between them, which he first sailed through, was called Cook's Strait; and as an evidence of his accurate observation, we may note that a dangerous rock in it, which has been several times announced of late as a new discovery, is clearly described by him. Quitting Cape Farewell, New Zealand, March the 31st, 1770, they reached the coast of New Holland, at Point Hicks, and Cape How, April 19. Coasting along to the northward, he gave most of the names to the capes and bays now so familiar to the colony of New South Wales, and anchored in Botany Bay, so named from the great quantity of plants collected by Mr. Banks and Dr. Solander. Passing out from this, May 6, he saw and named Port Jackson, and then passed Broken Bay, Port Stephens, Moreton Bay, Harvey Bay, and indeed all the eastern coast of Australia, passing through Torres Strait, and thence to New Guinea, Batavia, the Cape of Good Hope, St. Helena, and arrived at Deal, June 10, 1771.

The account of this interesting voyage was prepared for the press by Dr. Hawkesworth, who, by adding remarks of his own, called down some severe but unmerited remarks on the narrative. But it forms one of the most interesting memoirs in hydrography; and in this voyage, as is said by his friend and fellow officer, King—"he discovered the Society Islands; determined the insularity of New Zealand; discovered the straits which separate the two islands, and are called after his name: and made a complete survey of both.

He afterwards explored the eastern coast of New Holland, hitherto unknown; an extent of 27° of latitude, or upwards of 2,000 miles."

It certainly is marvellous that Cook should, almost within the memory of persons recently living, have discovered and named those countries now so familiar to Englishmen as are formed in their populous colonies of New Zealand and Australia. Respecting the accuracy of Cook's observations, they are unimpeachable. The minute accuracy of detail is not to be found in his charts which is required in modern times, but they certainly claim for him the title of the father of modern hydrography, a character more fully sustained by the result of his second voyage, which followed immediately on the completion of the first, and obtained for him great personal honour and the rank of commander.

The *second voyage* of Commander James Cook was undertaken for a different end. King George III., his former great patron, determined on sending him to the southern hemisphere, to determine the existence or non-existence of the supposed southern continent. This was determined on soon after his return in the *Endeavour*. He was appointed to the command of the *Resolution*, November 28, 1771; and Tobias Furneaux (who had been second lieutenant with Capt. Wallis) was appointed to the *Adventure*. These two ships had been colliers, and were chosen by Cook. They were equipped and victualled in a very superior manner to the ordinary mode, and the beneficial effects of the anti-scorbutics and other stores were soon manifest in the absence of scurvy throughout the voyage; it had always been a dreadful scourge in previous voyages. As a scientific corps, Mr. John Reinhold Forster, with his son, were appointed naturalists: the Board of Longitude agreed with Mr. W. Wales and Mr. W. Bayley as astronomers, and Mr. Hodges as artist. Each of these departments was most amply illustrated by the respective parties in separate publications. Some personal pique respecting accommodation, it is said, prevented Sir Joseph Banks from again accompanying Cook. But there is little doubt that his society must have been very irksome to Cook, placed as he was in circumstances which must have greatly interfered with the discipline of the ship.

The second expedition quitted Deptford, April 9, 1772, and left the Cape of Good Hope November 22, in search of the primary object of his voyage, the southern continent, reaching lat. 67° 15′ S., long. 40° E., January 17, 1773; but, as is well known, without meeting with any land between the meridian of the Cape of Good Hope and that of New Zealand. He entered Dusky Bay March 26. Capt. Furneaux had parted company February 7, and joined the *Resolution* in Queen Charlotte Sound, New Zealand. The ships then proceeded to Tahiti, and thence to the Tonga or Friendly Islands, called by Tasman Amsterdam and Middelburg, and again returned to Queen Charlotte Sound, in which passage they parted finally with the *Adventure*, which reached Queen Charlotte Sound after Cook had left. Here Furneaux had the

sad misfortune to lose a boat's crew, ten in number, who were murdered and eaten by the natives of Queen Charlotte Sound. He then stood to the S.S.E. to lat. 56° S., and arrived off Cape Horn in little more than a month from Cape Palliser, New Zealand, and thence on to the Cape of Good Hope and England. Cook again proceeded on his search for antarctic lands to the South, seeing the first ice in lat. 62° 10′ S., long. 172° W., December 8, 1773; and reaching his highest, lat. 71° 10′ S., long. 106° 54′ W., January 30, 1774. He now made his way to the northward, reaching Easter Island March 11, 1774, of which he gives a detailed account. Thence he went to the Marquesas, and afterwards to Tahiti, and other of the Society Islands, passing some of the islands of the Parmento group. In the passage thence he discovered Palmerston and Savage Islands, and touched at Namuka (Namocka), in the Tonga Islands. The New Hebrides were his next point, visiting Mallicolo, Tanna, Erromanga, and other islands. His next discovery was New Caledonia, one of the largest and finest islands of the Pacific, now in the possession of the French. He gives a considerable amount of detail respecting this island, and left it October 6, 1774, discovering Norfolk Island October 10, and again reached his former anchorage in Queen Charlotte Sound. He then, November 10, proceeded across the Pacific Ocean in a high latitude, supposing that his passage was the first ever made, not knowing that his consort, the *Adventure*, had preceded him. His passage was thirty-seven days to Cape Horn, and he finally reached England July 29, 1775.

Beside the very important additions he made to our knowledge of the geography of the Pacific, which have never been equalled by any single voyage, this had one very marked effect on all future nautical undertakings. All the histories of early discovery by long voyages have shown at what a dreadful cost the advantages of increased knowledge were purchased, in the wholesale destruction of the crews by that frightful disease, scurvy. The fate of Behring is an example of this. But it was reserved for Cook to demonstrate that protracted voyages might be made, even extending to three or four years, in all climates, without diminishing the probability of life in any degree. His system, the basis and commencement of that now in use in all well-conducted ships, was submitted to the Royal Society, who presented him with their gold Copley medal on that occasion. This alone will place Cook among the greatest benefactors to the maritime world.

The *third voyage* of Capt. Cook was the result of the great success which attended his former expeditions, and very quickly followed. His new ships were the *Resolution*, under his own command, and the *Discovery*, commanded by Capt. Clerke, his former lieutenant on board the *Resolution*. Among Cook's officers were Lieutenants Gore and King, and his master was William Bligh, all distinguished afterwards. With Capt. Clerke was Lieutenant (afterwards Admiral) James Burney, the historian of the Pacific. The expedition quitted Long Reach May 29, 1776; its object was the exploration of the North

Pacific, and to examine the connection or separation of the American and Asiatic continents. They passed round the Cape of Good Hope, and anchored in Adventure Bay, Van Diemen's Land; thence they sailed to their old port, Queen Charlotte Sound, in New Zealand; thence proceeded towards the Tonga group, discovering Mangeea and Atiu on the passage, and making a more minute examination of the Friendly Islands. Thence they proceeded towards Tahiti, discovering Tubuai. They landed Omai, a chief brought to England by Cook in his former voyage, at Tahiti, and then, proceeding to the northward, made the grand discovery of the Sandwich Islands. He saw and examined all of them, and has recorded many most interesting details of them. From the Sandwich Islands he proceeded to the N.W. coast of America, anchoring in Nootka Sound. Thence he proceeded to the N.W., examining the coasts, and entered Prince William's Sound and Cook's River (or Inlet), reaching Ounalashka. Thence he proceeded to the northward, through Behring's Strait to the icy barrier, establishing the real character of the countries and the erroneous condition of the maps. After again touching at Ounalashka, he made away for Karakakooa Bay, in Hawaii. Here the well-known tragedy occurred. Cook, the Lono or god of the Hawaiians, was killed, and science lost one of her greatest contributors. This sad event occurred February 14, 1779. Lieut. King then took the second command under Capt. Clerke. The ships proceeded to Awatska Bay, and again fruitlessly attempted the north-west passage. Before the return to Kamschatka, Capt. Clerke died, and Captains Gore and King became the commanders. They proceeded along the Japanese coast to Macao, and thence by the Cape of Good Hope, and reached Stromness, in the Orkneys, August 22, and the Nore October 4, 1780, the two ships having been absent four years, two months, and twenty-two days, and never having lost sight of each other but twice during their voyage. Thus concluded the most celebrated voyages of modern times, and from which dates a new era in hydrography. The account of Cook's last voyage was published under the superintendence of Dr. Douglas, Bishop of Salisbury, and is one of the most interesting works in the language.

The immediate predecessors of Cook in discovery had no mean harvest in the Pacific. The voyages referred to, as directed by King George III. in the early part of his reign, were recorded, or perhaps the narrative arranged, by Dr. Hawkesworth. The first of these was under Commodore Byron, who sailed from the Downs January 21, 1764, with the ships *Dolphin* and *Tamar*, and, passing through the Strait of Magalhaens into the Pacific, discovered the Islands Disappointment, George, Prince of Wales, Danger, Duke of York, and Byron, reaching England again May 9, 1766.

In the following August the *Dolphin* was again sent out under the command of Capt. Wallis, with the *Swallow*, under Capt. Carteret. They separated at the western entrance of the Strait of Magalhaens. Wallis discovered Whit-

Sunday, Queen Charlotte, Egmont, Duke of Gloucester, Duke of Cumberland, Maiatea, *Tahiti*, *Eimeo*, Howe, Scilly, Boscawen, Keppel, and Wallis Islands, and returned to England in May, 1768. Carteret pursued a different course, discovering Osnaburg, Gloucester, Queen Charlotte, Carteret, and Gower Islands, and the strait separating New Britain and New Ireland, and reached England in March, 1769.

The French at this time despatched Mons. Bougainville, in November, 1766, in the frigate *La Boudeuse*, with the store-ship *L'Etoile*. He entered the Pacific by the Strait of Magalhaens, in January, 1768, and discovered several islands in the northern part of the Low Archipelago, Lanciers, Harp, Thrum Cap, and Bow Islands. He also discovered Tahiti, and thought he was the first; then the Navigator Islands, and passed between the New Hebrides and the Louisiade, arriving in France in March, 1769.

While Cook was employed in the Pacific, the Spaniards were not behind in advancing discoveries.

The expedition in 1775, in the ships *Santiago* and *Sonoru*, under *Bruno do Heceta* and *Ayala*, made several discoveries on the coast of Oregon, &c. With these ships were the pilot *Antonio Maurelle* and Lieutenant *J. F. de la Bodega y Quadra*, names still retained in some places on the coast.

The discoveries of Cook had given a great impetus to the energies, commercial and exploratory, of every one at the time; and one circumstance, trivial in itself, led to great results.

During the third voyage of Cook, the sailors had procured a number of sea-otter skins on the N.W. coast of America, which sold at enormous profits at China. This fact led to important results. The voyages of *Portlock*, *Dixon*, *Meares*, *Tipping*, *Kendrick*, *Lowrie*, *Guise*, and others, and also indirectly of that of La Pérouse and Krusenstern, arose out of it.

The voyage of *La Pérouse* is one of the interesting points in maritime history. It was undertaken in order to the extension of French commerce, at the time when Cook's voyages had given so great an impetus to trade in the Pacific; and one of the first objects of the voyage of *L'Astrolabe*, under La Pérouse, and *La Boussole*, under Capt. De Langle, was to examine the N.W. coast of America, where the furs were procured. This was followed from Mount St. Elias (June 23, 1786) to Monterey, from whence they proceeded to Canton; after that to Kamschatka, sailing into the Sea of Saghalin. Their next destination was Navigator and Friendly Islands; and, lastly, Sidney, in New South Wales. After the ships quitted this port nothing more was heard of them, notwithstanding all the search and inquiry that was made; until the year 1826, some articles were found at Tucopia, which were traced to Vanikoro, where Capts. Dillon and D'Urville found undoubted evidence of the wreck of two ships, and the departure of the crews in a vessel built from the wrecks, but never more heard of.

One voyage about this period, better known for its fate than the scientific

results it obtained, is that of the *Bounty*, under Capt. William Bligh, who went to procure bread-fruit to convey to the West India Islands. The facts of the mutiny and escape of the mutineers to Pitcairn Island are now familiar to all. Lieutenant *Edwards*, in the Pandora frigate, was sent on an unsuccessful search for the mutineers in 1791. Bligh made a second but unpublished voyage to accomplish his object.

The unfortunate voyage of *D'Entrecasteaux* and *Huon-Kermadec*, in the French frigates *La Recherche* and *L'Espérance*, was for the purpose of ascertaining the fate of La Pérouse. They left Brest September, 1791, and returned in 1794. The principal additions they made to our knowledge were about Van Diemen's Land, S.W. Australia, New Caledonia, Louisiade, &c. But this knowledge was purchased with the death of the two commanders, and 99 out of 219 people, forming the original crews. An account of this voyage was given to the world by Admiral Rossel, and another by M. Labillardière.

La Pérouse had examined a considerable portion of the N.W. coast of America, but much remained to be done, which was left for Vancouver.

Capt. *George Vancouver* was an officer in Cook's second voyage towards the South pole, and also under Capt. Clerke, in his third and last voyage. He was appointed to the command of the *Discovery* sloop of war, December, 1790; his consort was the *Chatham*, an armed tender, under Lieutenant Broughton. The object of his voyage was a double one. The Spaniards had made some supposed aggressions at Nootka Sound, which the English were to resent, and the old theory of a large and navigable river to the Atlantic had been revived. Vancouver was to settle both these points. If this commander had not the varied talents and enterprise of his master Cook, his surveys at least give evidence of indefatigability. His surveys extend from the Bay of St. Francisco, lat. 30½° N., to Cape Douglas, the S.W. point of Cook's Inlet. The vast extent of a portion of the most intricate coast in the world appears to be delineated most faithfully. His object being to trace the continental continuity, the whole of the singular "canals" which penetrate the coast were minutely examined. He also determined the insularity of Vancouver Island, and the character of the dense and still unpeopled archipelagoes to the northward. As far as exact knowledge went, Vancouver may be said almost to be the discoverer of much of the coast. Besides this, his officer, Mr. Broughton, discovered the Chatham Islands, King George's Sound, South Australia, the Snares to the South of New Zealand; and a more full examination of the Sandwich Islands are a portion of the acquisition made in this expedition, which occupied from 1792 to 1794. Vancouver's longitudes vary very considerably from those of Cook, though the details of his survey have been highly applauded. Sir Edward Belcher had for one object to reconcile these differences. Vancouver's longitudes are, therefore, corrected in accordance with this and other more exact determinations.

The voyage to the N.W. coast of America by Commanders Galiano and Valdez, in the Spanish ships *Sutil* and *Mexicana*, and which were unexpectedly fallen in with by Vancouver, when proceeding to the northward at the back of Vancouver Island, was the *last* voyage made by the Spaniards for discovery in the North Pacific Ocean. A meagre account of was published by the government at Madrid in 1802. There is, however, a valuable historical introduction prefixed to it. The book itself is superseded by the elaborate and lucid work of Vancouver. The colonization of New South Wales, in 1788, by Governor Philip, led to some discoveries in the voyages of the ships which conveyed the convicts. The ships *Scarborough* and *Charlotte*, under Captains Marshall and Gilbert, have given two names to respective archipelagoes in the North Pacific, and there is also the voyage of Lieut. Ball, in H.M.S. *Supply*.

Capt. Don Alessandro Malaspina, an accomplished Italian in the service of Spain, was unfortunate, not in his voyage, but in offending Godoy, the well-known Prince of the Peace, who, on his return in 1794, threw him into prison at Coruña, where he was liberated by Napoleon in 1802. His voyage was in the *Descubierta;* his consort was the *Atrevida*, commanded by Capt. Bustamente. They examined the N.W. coast of America, between Prince William's Sound and Cape Fairweather, and also the S.W. coast of Mexico and Central America. His journals or charts have never been published. A sketch of his voyage is given in the introduction to the voyage of Galiano and Valdez, *but his name is never once mentioned* in it. The highest laudation is there given to the officers engaged in it. What we know of it is from the charts subsequently drawn up by Don Felipe Bauza, who was in the expedition. To this we owe some of our present knowledge of the Mexican coast alluded to.

The voyage of Capt. Etienne Marchand to Vancouver Island, &c., in 1791, would not be worth mentioning, were it not that the account of it is preceded by a really valuable historical and critical introduction by the talented geographer, Fleurieu.

Some years now intervened, and the Pacific was comparatively untraversed by scientific voyagers. But circumstances arose which led to the following voyage.

Adam John Von Krusenstern is the hydrographer of the Pacific. This is a proud position, and is worthily occupied. Beside this, he was the first Russian who circumnavigated the globe in a Russian ship. This is another interesting feature, but his services to his country are not second to either of them. He was the descendant of a noble family, and in his youth, by command of his government, he served for six years (from 1793 to 1799) in the English fleet. During this period, regretting that his country, with her vast power and resources, did not participate in the advantages of the growing commerce which was being established in all parts of the world, he conceived

the noble project of forming direct commercial relations between Russia, India, and China. To advance his patriotic scheme, he went to the East Indies, where he passed a year, studying its commerce, and then reached China, in order to gain some knowledge of its dangerous seas. He remained here two years (1798-99), and acquired numerous facts respecting the fur trade between China and the N.W. coast of America. On his homeward voyage he formed a plan to raise a mercantile navy to carry out his views of commerce between Russia and China. Like Columbus, he found himself neglected and misunderstood on his return, but, on the accession of Alexander, his propositions were appreciated.

The expedition consisted of the *Nadiéjeda* (the *Hope*) and the *Neva*. Capt. Krusenstern commanded the first in the expedition, and the second was commanded by Capt. Lisiansky. The object of the voyage was of a varied character. It was to be one of discovery and science; also to establish some plan by which the Russian-American Company could more conveniently communicate with their languishing colonies on the N.W. coast of America than by long and tedious journeys overland to Okhotsk. It was also destined to convey the ambassador appointed by the Russian Emperor to the court of Japan. And, finally, it was to be a voyage round the world, the first undertaken by the Russians. All these objects were triumphantly carried out by the excellent commander with but the loss of a single man, who was previously diseased!

The *Nadiéjeda* and *Neva* left Cronstadt August 7, 1803, and returned in 1806. Capt. Krusenstern's immediate sphere was Japan and its vicinity. He gave us the first true notions of its western side, and also has surveyed the eastern side of the great Peninsula or Island of Saghalin. His chart of the Japanese empire is a masterpiece. We cannot enumerate here all the points enquired into by this voyage; they will be found alluded to in various places in the work.

His consort, under Capt. Urey Lisiansky, a volunteer, but the senior officer to his commander, separated from the *Nadiéjeda* in the Pacific, and proceeded to her destination, Kodiack and the N.W. coast of America. We owe many details of the Sitka Islands, and nearly all we know of the Kodiack Archipelago, to Lisiansky.

It was during his voyages around Japan, the Sea of Okhotsk, and the Kurile Islands, Krusenstern tells us, that he conceived the idea of his great work, the Atlas of the Pacific Ocean, knowing how many perils, how many anxious moments, it would have spared him and his companions, had such a work been within their reach. Busily employed in the services of his profession, it was not until 1815 that he was allowed the leisure to pursue his favourite object, and this was in consequence of impaired vision. It is difficult to speak in sufficiently high terms of this noble work, the "*Atlas de l'Ocean Pacifique*," and the accompanying "*Recueil de Memoires Hydrographiques, pour servir*

d'Analyse et d'Explication à l'Atlas." The first part of this was published at St. Petersburg, in Russian and French, at the imperial expense, in 1824, and related to the South Pacific. That for the North Pacific appeared in 1827. In 1834 a supplemental volume, and a corrected edition of the Atlas, appeared; and several papers subsequently appeared in the bulletin of the Imperial Academy of St. Petersburg.

In these memoirs Vice-Admiral Krusenstern had embodied everything that had previously been observed in the Pacific, and in the most masterly manner he has reconciled the discordant materials at his command, and placed its hydrography upon an entirely new basis. Up to the date of these publications, it may be said that the work had exhausted the subject. Being in the French and Russian languages, their utility was somewhat contracted for the nautical world; and moreover the chief bulk of the remarks consist of discussions on the *scientific* basis on which the charts were constructed; and the whole of the American coast was reserved for a future work which was never produced. All the determinations, except where they have been superseded by later and better observations, have been followed in the present work.

The Russians have, besides the great Krusenstern, performed no small share of the discovery and exploration of the Pacific. Capt. *Frédéric Lütke* may justly claim a high position amongst hydrographers. His work, the Voyage of the *Séniavine*, though but little known, is an excellent one. Capt. Lütke surveyed the inclement coasts of Asia, from the North of Behring's Strait to the extremity of Kamchatka, and also made many observations in Behring's Sea. He has drawn up his useful memoir from many Russian sources besides his own labours. In the Caroline Archipelago, too, his explorations are very conspicuous.

The voyage of *Billings* (an Englishman who was with Cook), a very expensive one, was most unproductive. It was begun in 1785, by order of the Empress Catherine, "a secret astronomical and geographical expedition to navigate the Frozen Ocean between Asia and America." The vessels were built at Okhotsk, but were not ready till 1789, when one of them was immediately wrecked. The other only reached Mount St. Elias, stopping at Ounalashka, Kodiack, and Prince William's Sound. It then returned to Kamchatka, and its commander abandoned it. A melancholy picture is drawn of their sufferings by *Martin Sauer*, who, unfortunately for himself, was secretary. In the following year the expedition was resumed in the Sea of Behring, under Captains *Hall* and *Sarytscheff*, but was not very successful.

Otto Von Kotzebue, the son of the celebrated author, was a cadet on board the *Nadiéjeda*, under Krusenstern, in 1803—1806. He was selected by that great hydrographer to command a vessel sent out by the munificence of Count Romanzoff, and named the *Rurick*, to endeavour to penetrate to the North of Behring's Strait, and make other explorations. It left Cronstadt July 30, 1815,

and was unsuccessful in the primary object, and reached no farther than Kotzebue Sound, to the North of the West cape of America. Some discoveries in the Radack Channel, the Low Archipelago, and the Carolines, and other important services, were the results of this voyage, which lasted till August 3, 1818, when the *Rurick* anchored in the Neva.

His *second* voyage was in the Russian ship the *Predpriatie* (the *Enterprise*), and was intended to protect the Russian-American Company from the smuggling then carried on by foreign traders. The ship left Cronstadt July 28, 1823, and made many important additions to our knowledge of the Low Archipelago, surveyed the Navigator Islands, the Radack Islands, Sitka, and the Ladrone Islands, returning to Cronstadt July 10, 1826.

Among those at the head of these illustrious navigators who have enriched science by their exertions, *Jules Sébastian-César Dumont D' Urville* must be placed. His first expedition, in the *Astrolabe*, left Toulon April 22, 1826. He examined parts of the coasts of New Zealand, the Tonga Islands, the Fiji Islands, the Santa Cruz Islands, the Loyalty Islands, and then the great chain of reefs extending off New Caledonia. He then passed on to New Britain and New Ireland, and the North coast of New Guinea. On his return to Hobart Town he received intelligence that Capt. Dillon had discovered the remains of La Pérouse's expedition, to the scene of the loss of which, Vanikoro, he then repaired, as related in another part of this work. Quitting this, he passed on to Guam and part of the Carolines, arriving at the Mauritius September 29, 1828, and at Toulon March 25, 1829. More extended examinations have since been made of many of his explorations, but at the time the expedition greatly increased our then imperfect knowledge. His second voyage, though out of its chronological order, we will notice here.

The second expedition under M. D'Urville, consisting of the *Astrolabe* and *Zelée*, the latter under the command of Capt. C. H. Jacquinot, quitted Toulon September 7, 1837, and reached the South Shetland group, where he made many additions to our knowledge; thence entering the Pacific, he visited Manga Reva, Marquesas, Society Islands, Tonga Islands, the Fiji Islands, Vanikoro, the Salomon Islands, the Ladrone Islands, and then entered the Asiatic Archipelago, and hence to Hobart Town. Quitting this, he made for the antarctic regions, and discovered portions of the supposed continent. He then again examined some portions of New Zealand, the Louisiade, thence out of the Pacific, and reached Toulon November 6, 1840.

The frightful death of the celebrated Dumont D'Urville, who, with his wife and son, were by one accident hurried into eternity, May 8, 1842, will be long remembered in France. They were travelling on one of the Paris and Versailles railways, when, in consequence of the engine failing, the whole train was overturned and burnt, together with a large number (upwards of forty) of the passengers.

To the voyage of *M. Freycinet*, with the ships *L' Uraine* and *La Physicienne*,

in 1819, we owe the greater part of our knowledge of the Mariana or Ladrone Islands, and also of the Samoan group much information was acquired. This voyage was exceedingly productive in additions to natural history and science generally, and the Atlas Historique, accompanying the voyage, is really a fine work.

The voyage of Capt. *Duperrey*, the officer under Freycinet, sailed in *La Coquille* in 1822—1825, and made many additions to the hydrography of the central and western Pacific. His route was around Cape Horn, to Callao, Payta, the Low Archipelago, and Tahiti, which he reached May, 1823; thence to Port Praslin in New Ireland, New Guinea, the Moluccas, round to the West of Australia to Van Diemen's Land and Sydney; thence to the northward, through the Mulgrave Islands, &c., and, examining the Caroline Archipelago, reached France *viâ* the Cape of Good Hope. The whole of the accounts of this voyage have not appeared, but Capt. Duperrey has done good service to science by his current and variation charts.

The voyage of the *Blossom*, under Capt. Frederick William Beechey, is one of the most important, in a scientific view, that we have in the Pacific. It was undertaken to afford assistance to the expeditions which had been despatched from England, under Capt. (afterwards Sir John) Parry, for the discovery of a N.W. passage through the Arctic regions, and under Capt. (afterwards Sir John) Franklin, who intended descending the Mackenzie River and reaching Behring's Strait. The *Blossom* left Spithead May 19, visited Valparaiso and Pitcairn Island, minutely examined several islands in the Low Archipelago, and proceeded to Tahiti, and thence to the Sandwich Islands. The special object of the expedition was then proceeded with, and a minute survey made of the American coast of Behring's Sea and Strait, between King's Island and Point Barrow. As is well known, the other expeditions were not met with. The *Blossom* returned to and surveyed San Francisco in California, reaching there November 6, 1826. The next point was revisiting the Sandwich Islands, and thence to Macao. The Loo-Choo Islands were next visited and surveyed, as were the Arzobispo or Bonin Islands. Petropaulovski was next visited, and then the attempt again made to pass through Behring's Strait. The return thence was made by way of San Francisco, Valparaiso, and reached Woolwich October 12, 1828.

H.M.S. *Sulphur* left England December, 1835, under the command of Capt. F. W. Beechey, accompanied by the *Starling*, Lieutenant Kellett. Capt. Beechey invalided at Valparaiso, and was at last succeeded by Capt. (afterwards Sir Edward) Belcher (who had sailed in the *Blossom*) at Panama, February, 1837. The operations of the *Sulphur* consisted in determining the longitudes of points in dispute between Vancouver and Cook on the N.W. coast of America; examining and surveying several of the ports, and a portion of the coast of Central America and California; and returned to Panama from her first cruise in October, 1837. After this she proceeded across the Pacific,

visiting San Blas, Mazatlan, the Revilla Gigedo Islands, and the Marquesas; thence to Bow Island in the Low Archipelago, then Tahiti, the Fiji group, the New Hebrides, &c.; and then to an active part in the Chinese warfare, till nearly the close of the year 1841, when she sailed for England.

The surveying voyages of H.M.S. *Adventure* and *Beagle* are certainly the most important in the present hydrography of the Pacific. The whole of the Pacific coast of South America was most accurately delineated by their means. These two ships were commissioned in 1825, Commander P. P. King to the *Adventure*, and Commander Pringle Stokes to the *Beagle*. They left Plymouth May 22, 1826, commencing operations South of the Plata in the ensuing November. In August, 1828, the sad death of Commander Stokes occurred; he was temporarily succeeded by Lieutenant Skyring, but ultimately Capt. Robert FitzRoy commanded the *Beagle*. The result of this portion of the expedition was the noble survey of the South extremity of America, with the Strait of Magalhaens, from the La Plata to Chiloe; and the excellent instructions, quoted in our work, have added more to the security of navigation than anything which preceded them. The first expedition quitted Rio for England in August, 1830.

The second expedition, under Capt. FitzRoy in the *Beagle*, was commissioned July 4, 1831. The result of this was the completion of the survey of Tierra del Fuego, and the continuation from the Gulf of Peñas, northward, along the coasts of Chile and Peru, to Guayaquil. The Galapagos Islands were likewise included in this admirable survey. Leaving this coast, a chain of meridian distances was carried around the globe, the first of the kind, reaching Woolwich November 17, 1836. The directions drawn up in the survey, and given in the first part of this work from the appendix to Capt. FitzRoy's book, will say more in eulogy than we can. The labours of the accomplished naturalist, Charles Darwin, Esq., ought not to pass unnoticed here, though not connected with our subject.

The special object of the voyage of the French frigate *La Venus*, under Capt. *Abel du Petit Thouars*, in 1837—1839, was for the protection and encouragement of the whale fishery, and his voyage was framed with the view of collecting all information on this head, for the purpose of increasing and establishing the French whaling interest in the Pacific. The *Venus* left Brest December 31, 1836, and returned to that port June 24, 1839. She arrived at Valparaiso April 26, after staying at Rio fifteen days; thence to Callao, from whence she made way for Oahu, in the Sandwich group, where her commander interfered in the disputes between the religious parties, meeting here H.M.S. *Sulphur*, under Capt. Belcher. From Honolulu she proceeded westward, and reached Awatska Bay; thence she sailed for Monterey, arriving there October 18, 1837, with above thirty of her crew severely attacked with scurvy. Quitting Monterey she proceeded to Guadaloupe Island, which was examined, and the important position of Los Alijos Rocks ascertained.

Touching at Cape St. Lucas she reached Mazatlan, San Blas, and Acapulco, giving us some details of each of those places, and then to Valparaiso a second time, March 18, 1838. St. Ambrose and St. Felix Islands, called by the Spaniards the Unfortunate Islands, were next visited, and then Callao, surveying the Hormigas Rocks, and touching at the Galapagos. The Marquesas Islands were then surveyed. The northern part of the Low Archipelago was next traversed, and the *Venus* anchored at Papeite, at Tahiti, where, as at the Sandwich Islands, a convention was drawn up, assuring protection to French ships. Passing thence toward New Zealand, they examined several islands in their track, among which were the Kermadec, reaching the Bay of Islands October 12. Sydney was the next port, which was quitted December 18, 1838, and *La Venus* entered Brest June 24, 1839. Under the excellent observations of M. U. de Tessan many great additions to the hydrography of the Pacific were made; among which may be particularized the chart of the Marquesas, and of the several ports she visited. These will be found alluded to in their respective places, and his positions deserve much confidence. The scientific portion of the voyage received due attention, and many branches of natural history were thereby much enriched. The principal object of the voyage is fulfilled in the Report to the Minister of Marine, "On the Whale Fishery in the Pacific Ocean," comprising a full account of the armament, ships, ports, instructions, crews, discipline, nature of the fishery, &c., &c., and related in the third volume of the Narrative of the Voyage.

We should not omit one author, *Von Siebold*, who visited Japan in 1823—1830, and whose noble work on Japan ought to remove the stigma sometimes attached to the Dutch of their exclusiveness, in withholding information on the subjects which they only have the power to gain. His work on "Nippon" is most certainly worthy of a nation.

The *United States' Exploring Expedition* deserves especial notice for one particular—"It was the first, and is still the only one, fitted out by national munificence for scientific objects, that has ever left the shores of the United States." Its organization appears to have been arranged under great—all but insuperable—difficulties; its result is given to the world in five goodly volumes of narrative, a series of scientific memoirs, and an hydrographical atlas—works worthy of a great nation.

The act of Congress which authorized the undertaking is dated May 18, 1836, but it was not until March, 1838, that it devolved upon Lieutenant Charles Wilkes to re-arrange it and arrest it from complete failure. The ships composing the new squadron were the *Vincennes* sloop, 780 tons; the *Peacock* sloop, 650 tons; the *Porpoise*, a gun brig, 230 tons; and two tenders, formerly New York pilot-boats—the *Seagull*, 110 tons, and the *Flying Fish*, 96 tons. Of the respective labours of the five vessels it will be too diffusive to speak, and therefore the general results of the Expedition will be enumerated.

Their first field, the coast of South America, had been amply examined and surveyed by the English Admiralty, so that little or nothing was left for the Americans to add to hydrography here. The central portions of the American West coast were not approached; but the next examination was that of various points on the coast of Upper California, and many particulars were gathered respecting that country which was soon, and then so unexpectedly, to be the centre of such intense interest. Capt. Beechey, however, having previously excellently surveyed its principal port, this portion is of less importance. The Columbian River was the next point which was visited by the Expedition, and a survey made of its entrance. Capt. Belcher had also surveyed it, but its changing character renders a chart of little value for any length of time. Puget Sound was next surveyed, and Lieut. Wilkes bears ample testimony to the accuracy of our countryman, Vancouver's delineation of that singular and interesting inlet.

It is chiefly in the islands and archipelagoes of the Pacific that the great results of the American Exploring Expedition become more apparent. The centre of their operations was the Hawaiian group. Of this they have given us a large and detailed chart, and many most interesting particulars are given in almost all branches of science, respecting the physical and social character of the various islands composing it, especially of Hawaii and its geological features.

The Low Archipelago, or Paumotu group, was also partially surveyed in its north-western groups, and the south-western range correctly placed on the charts. In these islands many discrepancies were reconciled, and a true estimate formed of their area and form. Portions of the Society Islands, Tahiti, Eimeo, Huaheine, &c., also received their share of attention.

The Fiji group, however, is the great harvest of the Expedition. D'Urville had been here and partially surveyed it in 1827; but the Expedition made a complete survey of it in all its parts, and for the first time gave the world a correct notion of the extent and productions of this noble archipelago. The details of the customs and ferocity of the inhabitants are given with most intense interest in vol. iii. of the Narrative. One thing, however, ought to be noticed. Lieut. Wilkes treats the archipelago as if it had been entirely a new discovery of the American Exploring Expedition.

The Tonga or Friendly Islands were also visited, as was the Samoan or Navigator's group to the northward. To the northward still, the collection of islands now named the Union group was also correctly ascertained as to its numbers, character, and position.

The Phœnix group, northward, was also surveyed. The islands comprising Ellice's group were also severally examined and accurately delineated. The Gilbert Archipelago, or, as it is here termed, the Tarawan or Kingsmill group, received a large share of attention. In the still imperfectly known Marshall

Archipelago, the Radack and Ralick Channels of Kotzebue, several of the groups forming portions of it were examined and surveyed.

This embraces almost all the general results of the Expedition in the central portions of the Pacific. To this may be added the examination of the several portions of New Zealand, and the visits to Sydney. The longitudes obtained are generally dependent on the accuracy of the twenty-nine chronometers (all but two of which went well), and thus deserve all confidence.

One great point in the Expedition was the result of their antarctic cruises, in the supposed claim to priority in the discovery of the antarctic continent. We have elsewhere remarked on this subject, and to that the reader is referred.

In this brief enumeration of the services of the great navigators whose names have been quoted, we have necessarily omitted many very important particulars, but further allusion will be made to their special labours in the ensuing pages.

We have also, with the view of not unduly extending these prefatory remarks, not included many authors and observers who have contributed, in a lesser degree, to the hydrography of the Pacific; these, too, as far as their observations have been incorporated with our descriptions, have been enumerated in the body of the work. We have, therefore, now only to mention the names of Sir James Clark Ross, whose voyage to the South Polar regions, in company with Captain Crozier, in the well-known ships *Erebus* and *Terror*, added the Victoria Land to our geography, and placed the magnetic phenomena of the southern hemisphere in a clear light to the world.

The surveying voyage of the *Herald*, Capt. H. Kellett, R.N., C.B., brought some important additions to Pacific hydrography. He left England June 26, 1845, and after examining different parts of Chili and Peru, he commenced the survey of the Colombian coast, between Guayaquil and Panama, till then only known from the accounts of Dampier and other older authors. This survey was completed with the aid of Commander James Wood. During the progress of the work, the *Herald* made three voyages to the Arctic regions, through Behring's Strait, in aid of the expeditions then in search of the lost Franklin expedition.

The surveys of New Zealand and the surrounding region, by Captains Stokes and Byron-Drury, in H.M. ships *Pandora* and *Acheron*, between 1848 and 1858, deserve especial mention; but the particulars need not be specified. The same with the voyages of H.M.S. *Havannah*, under Captains Erskine and Harvey, who have added to our knowledge of many points. The long-continued services of H.M.S. *Herald*, under Captain Denham, in the Coral Sea, which, although no systematic or extensive survey was made, will be found duly acknowledged.

The French officers engaged in the protection of the military and other colonies in the Pacific, who have also done good service in the scientific and

surveying examinations of New Caledonia and other islands, will be found duly noticed.

Much additional later information, obtained from a variety of sources, is incorporated in the present edition of this work. We may more especially mention the work of Captain R. C. Mayne, R.N., who was for three years (1866—1869) employed in H.M.S. *Nassau*, re-examining the Strait of Magalhaens and channels leading from its western end to the Gulf of Peñas, now becoming an important highway; Captains Nares and Maclear, H.M.S. *Alert*, were also engaged in 1879—1880, surveying the Trinidad Channel and its approaches. On the East and South Australian coasts, Lieutenants Bedwell, Gowlland, Howard, Goalen, and Stanley, have done good work. Another important feature is the discovery of a shorter route between Australia and China, by means of a navigable passage through the Louisiade Archipelago, opened out by Capt. Moresby, R.N., who also gives for the first time a correct description and chart of South-eastern New Guinea, the result of his surveys in 1873-4. To our knowledge of the islands much has been added by H.M. ships on the Australian station, and forwarded through the commanding officers. During the years 1876—1880, Lieuts. W. U. Moore and L. S. Dawson, in H.M.S. *Alacrity*, examined a great part of the islands of the Fiji Group. H.M.S. *Challenger*, the U.S.S. *Narragansett*, the Chilian navy, and several New Zealand and Australian harbour-masters, have also afforded new knowledge.

Upon the basis of these scientific observers the geographical foundation of our knowledge in the Pacific rests. We need not recapitulate the subject, but in the ensuing tables the authorities upon which the geodetical positions and other particulars of the respective places rest are mentioned, and this will be sufficient.

GEOGRAPHICAL POSITIONS.

Although very much has been effected within a few years in the accurate determination of the relative geographical positions of the features of most countries, very much still remains to be done, more especially in the Pacific Ocean. The following tables, therefore, cannot be supposed to exhibit in all points, that connected accuracy which is to be found in the details of the coasts near to Europe, which from this cause are much more frequented and important.

The immense extent, too, of this great ocean is another source of difficulty in the exact determination of the longitudes of the various points distributed over its surface. The first connected series of meridional distances around the earth was that carried by Capt. FitzRoy, in H.M.S. *Beagle*, in 1831—1835, with from fourteen to twenty-two chronometers. This was conducted with the most refined precautions, yet the entire series was 33′ of time, or 8′ in arc, in

excess. A portion of this error, about 4′ 10″ in arc, has been shown to have arisen from the assumption of the meridian of Rio Janeiro in excess of the true longitude. This was demonstratad from the establishment of the meridian of Valparaiso through the national Observatory at Santiago.

There have been numerous chronometric observations by which the positions of a *few points* have been fixed with a considerable degree of accuracy: that is, to such a degree of refinement, that it is not probable that any but a ship or an expedition especially appointed for the purpose can be expected to improve upon.

The very great importance of this mode of observation—that of connecting a less-known with a well-ascertained point—has been so clearly shown of late years, and more especially by the late respected Lieutenant Harry Raper, to whom this branch of geography is so much indebted, that it is needless to dilate on it here. Some of the leading positions will be enumerated presently, by which it will be seen how much has been done, and from this what remains to be done, in this branch of science.

Astronomical observations for the determination of longitude require to be so accurately conducted, and in such extensive series, that all observations at sea, or on board ship, can only be regarded as rude approximations to the truth, and can only be depended on to direct attention to any *great* error in the reckoning or rate of the chronometer. It must be supposed that a very large number of the isolated spots in this ocean have been determined by such means, and therefore capable of every improvement. There are very few points, perhaps only two, where astronomical observations have been set up, either temporarily or permanently, which may be considered to have effected the result in an unimpeachable manner. The observations of Capt. Cook on the transit of Venus at Tahiti, the object of his first voyage, is open to doubt to the extent of several minutes of longitude. The same may be said of a great proportion of those navigators who have laboured in the same field; and it is only by a discussion of these contending results, and reconciling their discrepancies, that anything like uniformity can be attained.

In all these cases, where the improvement of hydrography is concerned, the particulars of the meridian from which any new point is determined, should be accurately specified, in connection with the new observations; as it is manifest that any change which arises from a more definite determination of the fundamental meridian, must equally affect that dependent on it. In the words of the great authority on this subject, Lieutenant Raper, "If navigators and hydrographers would agree to *consider*, for the time being only, certain important stations, as already established in longitude, whether really so or not, with the view of referring all the subordinate positions to them, the indistinctness which now hangs over absolute and relative positions would be forthwith cleared up. The question would be narrowed into the determination of *chronometric differences* alone, until a favourable opportunity occurred for the definite deter-

mination of a fundamental position." There is no part of the globe to which these remarks are more especially applicable than in the Pacific, nor more important than in the present state of its hydrography. They are therefore now pressed upon the attention of the navigator.

For the purpose of thus rendering subordinate stations serviceable in the connection of the various points with the *prime* meridian, Lieutenant Raper selected *twenty* points, in various parts of the globe, which will serve as *secondary* meridians for the districts in their vicinity. Five of these, Valparaiso, San Francisco, Sandwich Islands, Tahiti, and Sydney, refer to the Pacific; and as these have been discussed—and their accuracy is *almost* unimpugnable—as well as for the sake of uniformity, their longitudes assumed in the extensive tables in question will be followed here.

But it is by no means necessary, in the Pacific Ocean, to confine this subject to the above limits. These secondary meridians may, for the convenience of the navigator, be considerably extended: and, indeed, almost any well-defined position may be taken as such: but preference must be given to those which have been better determined than others, and the following enumeration of the principal points in the South Pacific may be serviceable:—

	In time.	In arc.
	H. M. S.	° ′ ″
Strait of Magalhaens; Sandy Point boathouse	4 43 34·47	70 53 37 W.
Valparaiso; Fort San Antonio	4 46 32	71 38 0 W.
Callao; Arsenal flagstaff	5 8 42	77 10 30 W.
Panama; N.E. Bastion	5 19 4·6	79 31 9 W.
New Guinea; Port Dorei, East pt. near head	8 56 20	134 5 0 E.
Fiji Islands; Ovalau Island, Levuka School-house.....	11 55 16	178 49 0 E.
Tahiti: Point Venus, S.E. extreme.....	9 57 56	149 29 0 W.
Sydney; Fort Macquarie	10 4 56	151 14 0 E.
Wellington, New Zealand; Pipitea Point.....	11 39 11·5	174 47 53 E.

The discussion of minor details, which might be extended to almost each item in the ensuing tables, would be both uninteresting and unnecessary. The authorities upon which the position assumed rests are quoted, and from them the confidence in the degree of accuracy they merit may be inferred; but there are numerous minor variations from the original observations, which are explained in the text, or may be found in the works quoted. The longitude given by the various observers has been corrected in many instances by later determinations.

TABLE

OF

POSITIONS, TIDES, MAGNETIC VARIATIONS, ETC.,

IN THE

SOUTH PACIFIC OCEAN.

	Lat. South.	Long. West.	Authorities.	Var. East. 1884.	Tides.		Page
					H. W.	R ange.	
	° ′ ″	° ′ ″		° ′	H. M.	FT.	
I.—The STRAIT of MAGALHAENS.							
Cape Virgins, S.E. extreme	52 20 10	68 21 0	The surveys of				5
Dungeness Point, beacon	52 23 50	68 25 40	H.M.S. *Adventure*	19 25	8 30	44	7
Point Catherine, N.E. extr.	52 32 30	68 45 20	and *Beagle*, Capts.	19 10			9
Cape Espiritu Santo, N.E. cliff	52 40 20	68 35 0	P. P. King, R.N.,				8
Dinero Mount, summit	52 19 40	68 34 15	F.R.S., &c.; Capt.				9
Cape Possession, beacon	52 18 0	68 56 30	T. Stokes, R.N.;	19 35	8 40	40	10
Mount Aymond, summit, 867 ft.	52 9 0	69 29 0	and Capt. R. Fitz-				11
Possession Bay, Tandy Point	52 15 10	69 20 10	Roy, R.N., 1826—		8 35	42	10
Point Delgada, extreme	52 27 15	69 32 10	1830; H.M.S. *Beagle*,				12
Point Catherine, N.E. extremity	52 32 30	68 45 20	Capt. R. Fitz-				9
Cape Orange, N. extremity	52 28 40	69 22 40	Roy, R.N., 1831—	19 55	9 0	46	11
Cape Gregory, extremity	52 39 30	70 12 10	1834; and H.M.S		9 30	21	15
Cape San Vicente, W. extreme	52 47 0	70 25 25	*Nassau*, Capt. R.				16
Peckett Harbour, S. point	52 47 10	70 44 30	C. Mayne, R.N.,		9 30	7	18
Elizabeth Island, N.E. bluff	52 50 30	70 36 15	C.B., 1866-9.	20 30	9 47	8	17
Point Gente Grande, N.W. extr.	53 1 5	70 24 30					20
Sandy Point, boat-house	53 10 0	70 53 37			Noon.	5	21
Point St. Mary, extremity	52 21 40	70 56 30		20 37			23
Port Famine; Obs. Spot	53 38 12	70 56 4		20 45	Noon.	6	24
,, ,, Pt. St. Anna, extr.	53 38 0	70 53 45					24
C. Valentyn, summit at extreme	53 33 30	70 31 30					27
Admiralty Sound, Pt. Cook, riv.	54 17 10	70 1 43					27
,, ,, Latitude Pt., ex.	54 16 45	69 54 45					27
Mount Graves, S. summit	53 45 0	70 35 30					27
Pt. S. Antonio, Humming bd. Co.	53 54 8	70 52 8					27
Cape San Isidro	53 46 30	70 58 30		21 0	1 0	8	25
Mt. Tarn, peak at N. end, 2,602 ft.	53 44 30	71 25 0					25
Nassau Island, S.E. point	53 50 23	71 4 50				6	26
Cape Froward, sum. of bluff	53 53 43	71 17 45		21 10	1 0	6	26
Magdalen Sound & Cockburn and Barbara Channels.							
Mount Vernal, summit	54 6 28	71 1 14					29
Mt. Boqueron, highest pinnacle	54 11 20	70 59 14					29
Mt. Sarmiento, N.E. pk., 6800 ft.	54 27 15	70 51 50					28
Labyrinth Isles, Jane Id., sum.	54 19 10	71 1 20		21 5	0 30	6	29
Cape Turn, extremity	54 24 8	71 7 45			1 20	6	29
King Island, summit	54 22 38	71 17 40		21 15		7	29
Prowse Islands, E. id., E. extr.	54 22 13	71 24 30					30
Dyneley Sound, S.E. end of N.E. Baynes Island	54 18 15	71 35 0					30
Cayetano Peak	53 53 4	72 8 40					31
Elvira Point, extremity	53 50 0	72 2 35					34
Smyth Harbour, Mt. Maxwell	53 47 30	72 15 0					31

	Lat. South.	Long. West.	Authorities.	Var. East. 1884.	Tides. H. W.	Tides. Range.	Page
	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Cape Edgeworth, N. extremity-	53 47 3	72 8 20	The surveys of H.M.S. *Adventure* and *Beagle*, Capts. P. P. King, R.N., F.R.S., &c.; Capt. T. Stokes, R.N.;				31
THE STRAIT OF MAGALHAENS, FROM CAPE FROWARD TO THE PACIFIC OCEAN.							
Cape Froward, sum. of the bluff	53 53 43	71 17 45	and Capt. R. Fitz-				26
Cape Holland, S.E. extreme -	53 48 33	71 38 25	Roy, R.N., 1826—	21 20	10 40	6	32
Port Gallant, Cross Id., E.extr.-	53 42 3	71 59 20	1830; H.M.S. *Beagle*, Capt. R. Fitz-		0 34	8	33
Cordes Bay, W. outer point -	53 42 55	71 55 50					32
Dos Hermanas Island, summit -	53 58 0	71 24 15	Roy, R.N., 1831—				34
Cape Inglefield, islet off it -	53 50 50	71 54 53	1834; H. M. S.				34
Mount Pond - - -	53 51 45	71 55 30	*Nassau*, Capt. R.				34
Elvira Point, extremity -	53 50 9	72 2 35	C. Mayne, R.N.,				34
Charles Islands, Wallis Mark -	53 44 18	72 4 45	C.B., 1866—1869;				35
Rupert Island, summit - -	53 39 40	72 12 30	and H.M.S. *Alert*,				35
Cape Crosstide, extreme -	53 33 30	72 25 30	Capt. J.P.Maclear,	21 40	1 40	5	35
El Morion or S. David Hd., sum.	53 33 45	72 32 5	1880.	21 47		6	37
Cape Quod, extremity - -	53 31 55	72 33 50					36
Snowy Sound, islet at ent. N.ex.	53 30 45	72 41 10					37
Cape Notch, extremity - -	53 25 23	72 47 55		21 45			38
Playa Parda Cove, Shelter I. su.	53 17 18	73 4 15			1 8	6	39
Half Port Bay, entrance - -	53 13 10	73 20 30		21 45	2 0	6	41
St. Anne Island, E. summit -	53 9 5	73 13 15			4 0	5	44
Cape Upright, extr. N. trend -	53 5 25	73 36 45			2 30	6	45
Cape Tamar, S. extreme -	52 56 10	73 46 30		21 55	2 30	6	43
Point Felix, extremity - -	52 56 30	74 8 30					46
Valentine Harbour, Observ. Mt.	52 55 0	74 17 45			2 0	6	46
Cape Cortado, N. extremity -	52 49 37	74 26 0		22 5			47
Cape Parker, western sum. over	52 42 0	74 12 30					45
Westminster Hall, E. summit -	52 37 18	74 22 50					45
Observation Mount, summit -	52 27 0	74 34 32		22 0	1 0	5	45
Harbour of Mercy, Bottle I., su.	52 44 58	74 39 30			1 22	4	47
CAPE PILLAR, northern cliff -	52 42 50	74 42 30		22 10	1 0	4	47
Cape Victory, extremity -	52 16 0	74 54 20					45
EVANGELISTS, or Isles of Direction, Sugarloaf Islet -	52 24 18	75 5 45		22 15	1 0	5	45
II.—THE OUTER COAST OF TIERRA DEL FUEGO.							
S. Sebastian B., Pt. Arenas, S. ex.	53 9 10	68 11 20					53
,, C. S. Sebastian, N. height	53 19 25	68 9 0		19 25	7 0	13	54
Cape Sunday, N.E. cliff	53 39 50	67 57 0			6 0	12	54
Cape Penas, S.E. cliff - -	53 51 30	67 32 50		19 30	6 42	12	54
Cape San Pablo, N.E. cliff -	54 16 20	66 40 0					54
Table of Orozco, S.E. su. 1000 ft.	54 40 40	65 59 30					54
Policarpo Point, extreme -	54 39 0	65 38 40					54
Cape San Vicente, extreme -	54 38 40	65 14 0			4 30	10	54
CAPE SAN DIEGO, E. extreme -	54 41 0	65 7 0		18 30	4 30	10	55
STATEN ISLAND, Cape St. Bartholomew, S.W. cliff -	54 53 45	64 45 30		18 20	4 45	9	56
,, C. St. Anthony, N. ex. cliff-	54 43 30	64 33 45					56
,, New Year Islands, N.E. pt.	54 39 15	64 6 20		18 0	5 30	6	56
,, Cape St. John, N. cliff -	54 42 20	63 43 45			5 30	9	56
,, Mount Richardson, summit -	54 45 50	63 50 55					57
Good Success Bay, N. head -	54 47 0	65 11 30			4 3	6—8	59
Cape Good Success, S. extreme -	54 54 40	65 22 0					59
Campana or Bell Mount, sum. -	54 53 15	65 33 50					61
Aguirré Bay, Kinnaird Point -	54 57 45	65 46 0		19 0	4 20	8	61
Beagle Channel, Cape Mitchell-	54 57 30	68 14 0					62

	Lat. South.	Long. West.	Authorities.	Var. East, 1884.	Tides.		Page
					H. W.	Range.	
	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Beagle Channel, Ushuwia Mis.	54 53 0	68 12 0	The surveys of				62
„ „ Cape Divide	54 59 10	69 6 10	H.M.S. *Adventure*				62
„ „ Kekhlao Cape	55 10 0	70 3 20	and *Beagle*, Capts.				62
New Island, Point Waller, extr.	55 10 10	66 28 30	P. P. King, R.N.,				63
Lennox Road, Luff Island, sum.	55 18 20	66 45 35	F.R.S, &c.; Capt.	19 30	4 40	8	63
Goree Road, Guanaco Point, ex.	55 19 0	67 9 0	T. Stokes, R.N.;		4 0	8	63
Terhalten Island, summit	55 26 15	67 1 30	and Capt. R. Fitz-				63
Evout Isles, N.E. head	55 33 0	66 44 30	Roy, R.N., 1826—				64
Barnevelt Islands, N.E. extr.	55 48 25	66 44 30	1830; H.M.S.	19 45	4 30	8	64
Deceit Island, C. Deceit, E. ex.	55 55 30	67 1 25	*Beagle*, Capt. R.				65
Wollaston Island, C. Scourfield	55 45 15	67 8 0	FitzRoy, R.N.,				65
Herschel Is., Mt. Herschel, sum.	55 49 45	67 19 0	1831—1834; and				65
CAPE HORN, summit	55 58 40	67 16 10	H.M.S. *Nassau*,	20 5	4 40	9	66
Hermite Island, St. Martin Cove			Capt. R. C. Mayne,				
Observation Station	55 51 20	67 34 0	R.N., C.B., 1866-9.	20 10	3 50	8	66
„ Kater's Peak, 1,740 feet	55 51 55	67 32 50					66
„ Maxwell Island, summit	55 47 30	67 30 15					67
„ Cape Spencer, S.E. extr.	55 55 0	67 36 40			4 40	8	68
Packsaddle Island, summit	55 23 50	68 3 20		20 10			69
Orange Bay, Burnt Island, sum.	55 31 0	68 2 0			3 30	5	68
Point Lort, E. pitch	55 37 30	67 58 0			4 30	7	68
False Cape Horn, S. extreme	55 43 15	68 5 10		20 20	3 25	6	68
DIEGO RAMIREZ ID., high sum.	56 28 50	68 42 45		20 47	4 0	6	69
Ildefonso Isles, highest summit	55 52 30	69 17 30			3 20	6	70
New Yr. S., C. Weddel, S.W. pt	55 33 0	68 45 30					70
Henderson Id., M. Beaufoy, su.	55 36 15	68 57 0					70
„ Brisbane Head, extr. sum.	55 39 0	68 56 30					70
Hope Island, S. extr. sum.	55 32 30	69 38 50					71
York Minster, summit, 800 feet	55 24 50	70 3 45		20 55			72
Capstan Rocks, sum. of largest	55 24 10	70 19 30					72
Cape Alikhoolip, S. extreme	55 11 50	70 50 0					72
Phillips Rocks, largest, summit	55 14 10	70 57 30					72
Treble Island, S. summit	55 7 50	71 1 50		21 30	3 0	5	72
Cape Castlereagh, summit	54 56 0	71 30 0			2 50	4	72
CAPE DESOLATION, S. summit	54 45 40	71 38 0		21 35	1 40	4	73
London I., Horace Peaks, S. su.	54 43 0	71 57 25					73
Fury Harbour, W. point	54 28 25	72 18 30					73
Tussac Rock	54 33 0	72 12 10				5	73
West Furies, largest rock	54 34 45	72 20 50		21 55	2 30	4	73
East Furies, largest rock	54 38 30	72 11 45					73
Mount Skyring, summit 3000 ft.	54 24 48	72 11 30					73
Bynoe Island, summit	54 19 0	72 12 44					74
Tower Rocks, E. rock	54 37 15	73 3 15		22 15	2 30	5	74
Cape Noir Island, S. extreme	54 30 0	73 6 15			2 25		74
Kempe Peaks, E. summit	54 23 30	72 29 10					73
Ipswich Isles, S. summit	54 10 30	73 21 0					74
Gloucester Cape, S.W. extreme	54 5 18	73 30 15		22 10	1 30	5	75
Fincham Islands, summit of W.	53 44 15	73 46 0					76
Cape Tate, summit	53 37 15	73 51 30					76
Landfall I., C. Schetky, S. pitch	53 21 40	74 14 0		22 15	2 0	5	76
„ Cape Inman, cliff summit	53 18 30	74 20 15					76
Cape Sunday, summit	53 10 30	74 22 0					77
Cape Deseado, peaked sum. near	52 55 30	74 37 50					77
Dislocation Harbour, Obs. Stat.	52 54 15	74 36 50			1 40	4	77
Judge Rocks, westernmost	52 51 0	74 48 15			1 0		78
Apostle Rocks, W. large rocks	52 46 15	74 46 50					78
CAPE PILLAR, northern cliff	52 42 50	74 42 30		22 10	1 0	4	78

	Lat. South.	Long. West.	Authorities.	Var. East, 1884.	Tides. H. W.	Tides. Range.	Page
	° ′ ″	° ′ ″		° ′	H. M.	FT.	
III.—The WESTERN COAST OF PATAGONIA, FROM THE STRAIT OF MAGALHAENS TO CHILOE.			The surveys of H.M.S. *Adventure* and *Beagle*, Capt. P. P. King, R.N., F.R.S., &c.; Capt. T. Stokes, R.N.; and Capt. R. Fitz-Roy, R.N., 1826–1830; H.M.S. *Beagle*, Capt. R. Fitzroy, R.N., 1831—34; H.M.S. *Nassau*, Captain R.C.Mayne, R.N., C.B., 1866—1869; and H.M.S. *Alert*, Captain Sir Geo. Nares, K.C.B., and Capt. J. P. Maclear, 1879.				
The Evangelists, or Islands of Direction, Sugar-loaf	52 24 18	75 5 45		22 15	1 0	5	45
Cape Victory, extremity	52 16 0	74 54 20					80
Cape Isabel, W. extreme	51 50 0	75 9 30					80
Cape George, bluff summit	51 36 0	75 19 30					81
Cape Santa Lucia, summit	51 31 15	75 22 0		21 55			81
White Horse Islet, N. summit	51 7 50	75 10 0					81
Cape Santiago, summit	50 42 0	75 27 45					81
April Peak, summit	50 10 0	75 22 30					81
Cape Three Peaks, or Tres Puntas, Rugged Head	50 1 30	75 23 40					82
Port Henry, Parr Point	50 0 20	75 20 0		21 25	Noon.	5	82
Cape Primero, extremity	49 50 55	75 35 10					88
Mount Corso, S.W. summit	49 46 30	75 32 30					88
Cathedral Mount, summit	49 46 35	74 49 10					87
Cape Montague, W. cliff	49 7 30	75 38 0					89
Parallel Peak, summit	48 45 40	75 29 0					89
Rock of Dundee, summit	48 6 15	75 40 30					89
Cape Dyer, extremity	48 5 30	75 33 0					89
Port Santa Barbara, W. head	48 2 0	75 27 45		20 55	0 28	6	89
Bynoe Islands, N.E. island	47 58 0	75 21 30					90
Guaianeco Islands, Byron Island, W. point	47 46 0	75 20 0					91
,, Wager Id., S.E. point, extr.	47 47 30	74 53 0					91
Ayautau Islands, sum. of largest	47 35 45	74 45 0					91
Channel's Mouth, C. Machado-Xavier Island, Ignaceo Beach	47 27 40	74 29 0					91
Kelly Harbour, S. point extr.	47 10 0	74 27 30		20 25			92
Forelius Peninsula, isthmus, narrowest point	46 59 30	74 9 30					92
Cirujano Island, N.E. point	46 50 0	74 40 30					93
Purcell Island, summit	46 51 10	74 21 0					93
St. Paul's Dome, sum. 2,284 ft.	46 55 20	74 39 10					94
Port Otway, S. entr., sum.	46 49 31	75 17 10					94
Cape Tres Montes, extremity	46 58 57	75 26 0	*Termination of H.M.S. *Beagle's* Surveys in 1830.	20 30	11 37	6	95
Channels leading North from Magalhaens Strait.							95
Sholl Bay, Observation place	52 44 10	73 52 58			11 45	6	96
Otter Bay ,, ,,	52 22 31	73 40 3					98
Isthmus Bay ,, ,,	52 9 34	73 36 33			1 30	5	99
Victory Pass, Eppic Island	51 57 0	73 42 0			1 25	6	99
Mayne Harbour, Obs. place	51 18 29	74 4 0			1 40	6	101
Puerto Bueno ,, ,,	50 29 26	74 11 50			0 24	8	102
Cape Somerset	50 3 30	74 38 10					86
Port Grappler, Obs. place	49 25 19	74 17 39					110
Eden Harbour ,, ,,	49 7 30	74 25 10			0 15	6	112
Halt Bay & Gray Harb., Ob. l.	48 54 20	74 20 55					115
Cape Raper, rock close to	46 49 10	75 39 30					117
Cape Gallegos	46 35 0	75 36 0					117
Christmas Cove, Ob. St. at S.E. ex	46 35 0	75 32 30		20 30	0 45	5	117
The Cone, summit, 1,300 feet	46 34 10	75 29 0					117
Rescue Point, N. summit	46 18 10	75 11 0			0 14	5	118
Hellyer Rocks, middle	46 4 0	75 12 0					118
Cape Taytao, W. extremity	45 53 0	75 6 0					118
Anna Pink B., Patch Cove, O.S.	45 52 15	74 52 50		20 7	0 45	5	118

	Lat. South.	Long. West.	Authorities.	Var. East, 1834.	Tides. H. W.	Tides. Range.	Page
	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Anna Pink Bay, Port Refuge,							
Puentes Island, summit	45 51 36	74 49 0	The survey by				118
Ynche-mo Island, S.E. summit	45 48 5	74 58 30	Capt. R. FitzRoy,	20 10	0 45	5	118
Menchuan Island, summit	45 36 0	74 53 30	R.N., 1831-1834,				118
Mount Isquiliac, sum. 3,000 ft.	45 20 0	74 29 40	and Chilian Sur-				118
Vallenar Road, Three Finger			veys.				
Island, S.E. extremity	45 18 30	74 34 15	- - -	19 52	0 18	5	119
Socorro, or Huamblin Id., S. ex.	44 55 50	75 10 0					119
Ypun, or Narborough Island,							
John Point, extremity	44 40 40	74 44 30					120
Mount Mayne, summit, 2,080 ft	44 9 0	74 8 45					120
Guayteca Island, central sum.	43 52 45	73 58 0					120
Port Low, rocky islet in harbour	43 48 30	73 59 5	- - -	19 10	0 40	7	120
Queytao Islet, summit	43 42 15	73 32 0					120
Huafo I. or No Man's Land, S.ex.	43 41 50	74 43 0					121
,, summit over Weather Point	43 35 30	74 45 40	- - -	19 24	Noon	7	121
IV.—ISLAND OF CHILOE.							
Canoitad Rock, summit	43 30 0	73 48 0					124
San Pedro Mntn., sum. 3,200 ft.	43 20 30	73 46 0					124
San Pedro Passage, N. point	43 18 30	73 39 15			0 30	9	124
Yanteles Mntn., S. sum. 6725 ft.	43 30 0	72 46 30					—
Corcovado Volcano, sum. 7510 ft.	43 11 20	72 44 40	- - -	18 35			—
Huapi Quilan Islets, S. summit	43 29 30	74 11 30					125
Cape Quilan, S.W. extreme	43 17 10	74 23 0					125
Cape Matalqui, W. extreme	42 10 40	74 11 30					125
Matalqui Height, or Paps, sum.	42 10 30	74 8 0					125
Huachucucuy Head	41 46 0	74 0 10					125
Corona Head, lighthouse	41 46 45	73 52 45					125
San Carlos Town, landing							
place at Mole	41 52 0	73 49 35	- - -	18 30	0 14	6	126
Point Tres Cruces, extr. pitch	41 49 30	73 28 20			1 15	16	129
Huapilinao Head, summit	41 57 36	73 29 20			1 25	15½	129
Lobos Head, summit	42 4 0	73 23 30			0 29		130
Oscuro Port, East point	42 4 0	73 26 0			0 55	20	130
Quintergen Point, summit	42 9 15	73 21 0					130
Changues Islands, North end	42 13 30	73 10 30			0 35		130
Quicavi Bluff	42 14 10	73 20 0			0 57	20	130
Dalcahue, chapel	42 25 0	73 41 30			0 26		131
Castro Town, easternmost part	42 27 45	73 45 40	- - -	18 10	0 11	18	132
Yal Point, summit	42 38 15	73 39 30			0 55		133
Lemuy Id., Apabon peaked hill	42 40 0	73 32 30			0 55		133
Talcan Harbour, S. entr. pt.	42 46 30	72 55 0			1 3	16	133
Minchinmadom Volcano, sum-							
mit, 8,000 ft.	42 48 0	72 30 30					134
Mount Vilcun, summit	42 48 50	72 49 30					134
Point Centinela, extreme	42 59 25	73 19 0					134
Huildad Inlet, entrance	43 3 0	73 30 0	- - -	18 50	0 48	20	135
Laytec Island, S.E. extreme	43 15 5	73 33 0			0 37		136
Abtao Island, South point	41 50 0	73 19 40			0 50	18	136
Calbuco Fort, E. end of island	41 46 5	73 7 30					137
Puluqui Id., Centinela, or S. pt.	41 51 0	73 3 30			1 5		137
Port Montt, Tenglo Id., N. pt.	41 30 15	72 54 30			0 48	20	138
Osorno Mountain, summit	41 6 40	72 29 30					139
V.—THE COAST OF CHILE, FROM SAN CARLOS TO MEXILLONES.							
Carelmapu Point	41 45 0	73 43 30	- - -	18 30	0 50	10	143
Maullin, Amortajada, N. extr.	41 37 0	73 40 45					143
Point Godoy, S.W. extreme	41 34 50	73 47 20					144

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	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Cape Quedal, summit	41 3 0	73 57 0	The survey by				145
S. Pedro Bay, Manzano Cove	41 0 0	73 53 0	Capt. R. FitzRoy,				145
Manzano Cove, rivulet, mouth	40 33 20	73 43 0	R.N., 1831-1834,				145
Milagro Cove, depth of	40 16 0	73 42 30	and Chilian Sur-				145
River Bueno, entrance (bar)	40 17 0	73 43 0	veys.				145
Point Galera, lighthouse	40 1 30	73 44 10					146
Falsa Point, sum. over (highest)	40 0 50	73 39 0					146
Valdivia, O. S. nr. Fort Corral	39 52 53	73 26 0	- - -	17 45	10 35	5	147
Gonzales Head, N.W. pitch	39 51 15	73 29 0					147
Valdivia Town, landing place opp. church (Hospital Mole)	39 49 2	73 15 45	- - -	17 43	10 45		148
Chanchan Point, islet off	39 26 40	73 15 45					149
River Tolten, mouth	39 15 0	73 14 0			10 28	5	149
Cauten (or Imperial) Riv., mouth	38 48 30	73 23 0					150
Cauten Head Cliff, summit	38 40 15	73 27 30					150
Cape Tirua, summit of islet off	38 22 40	73 30 0					150
Mocha Island, S. summit	38 24 50	73 54 0			10 30		151
,, ,, N.W. point	38 20 0	73 58 20	- - -	17 20			151
Morguilla Point, S.W. extreme	37 50 30	73 39 0					152
Point Tucapel, extreme	37 37 0	73 41 0					152
River Lebu, entrance	37 37 15	73 40 0	- - -	17 5	10 30	5	152
Carnero Head, N.W. summit	37 21 20	73 41 0					152
Cape Rumena, N.W. cliff, sum.	37 14 45	73 38 45					152
Point Lavapie, extremity	37 8 50	73 35 45					152
Laraquette River, mouth	37 9 30	73 12 20					154
Arauco Fort, middle	37 14 30	73 20 0			10 15	5	154
Tubul River, entrance	37 14 25	73 24 30					154
Lota Bay, North point	37 5 20	73 11 45					155
Point Coronel, W. extremity	36 59 30	73 12 30					156
Santa Maria Id., landing place	37 2 48	73 31 0	- - -	16 55	10 20	6	152
Concepcion City, mid. nr. to riv.	36 49 0	73 2 30					157
River Bio Bio, S. entrance point	36 48 45	73 9 30					156
Bio Bio Paps, S.W. summit	36 46 20	73 11 30					157
Point Tumbes, N.W. cliff	36 37 15	73 7 20					157
Talcahuano, Fort Galvez	36 42 0	73 6 45	- - -	16 50	10 14	5	158
Mount Neuke, summit	36 34 55	72 55 0					160
Coliumo Head, N. extreme	36 31 30	72 58 30					160
Carranza Point, S.W. extreme	35 37 20	72 39 20					160
Cape Humos, summit	35 22 50	72 29 0					160
Maule, Church Rock	35 19 40	72 25 40	- - -	16 12			161
Maule River, S. head entrance	35 19 15	72 24 50			9 30	3	161
Topacalma Point, sum. on extr.	34 8 0	72 1 0					162
Navidad Bay, Riv. Rapel, S. pt.	33 55 0	71 49 0					163
Rapel Shoal	33 51 30	71 52 30					163
Maypu River, S. entrance head	33 39 20	71 39 15					163
White Rock Point, White Rock	33 29 0	71 44 0					163
Curaumilla Point, rock off	33 6 0	71 45 0					164
VALPARAISO, Fort San Antonio	33 1 53	71 38 0	Capt. Mayne.	15 12	9 32	5	165
Santiago, Astronomical Obs.	33 26 42	70 40 36	The survey by				—
Quillota, Bell, summit	32 58 0	71 7 30	Capt. R. FitzRoy,				167
Concon Rock, largest	32 52 30	71 34 0	R.N., 1831-1834;				167
Quintero Point, summit	32 46 0	71 32 30	and Chilian Sur-				169
Quintero Rocks, body	32 42 0	71 32 30	veys.				169
Aconcagua Mountain, summit	32 38 30	69 57 30					169
Papudo Bay, S.W. end	32 30 9	71 28 0	- - -	15 0			170
Pichidanque, S.E. pt. of island	32 7 55	71 32 45			9 20	5	170
Conchali Bay, islet in middle	31 53 0	71 32 30					171
Cape Tablas, S.W. extremity	31 51 45	71 34 0					172
River Chuapa, S. entrance point	31 38 0	71 33 0					174
Oscuro Cove, N. point, summit	31 27 20	71 36 0			9 0	6½	174
Maytencillo Cove, N. head	31 17 5	71 38 45					174
Talinay Mount, summit	30 50 45	71 38 30					174

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	° ′ ″	° ′ ″		° ′	h. M.	FT.	
Limari River, S. head	30 44 45	71 43 25	The survey by				174
Lengua de Vaca, extremity	30 13 40	71 38 30	Capt. R. FitzRoy,				175
Herradura de Coquimbo Port S.W. corner	29 59 0	71 22 45	R.N., 1831-1834, and Chilian Surveys.	14 10	9 8	5	176
Coquimbo Port, N. Islet (rock)	29 55 10	71 22 10			9 8	5	178
Arrayan Cove, S. point	29 42 20	71 20 45					180
Juan Soldado Mountain, sum	29 41 30	71 17 25					180
Pajaros Islets, southern summit	29 35 0	71 33 25					180
Yerba Buena, village, chapel	29 34 0	71 18 50					180
Tilgo Island, S.W. point	29 32 35	71 21 20					180
Tortoralillo, S. entrance point	29 29 15	71 20 45	- - -	14 0			181
Chungunga Islet, summit	29 24 15	71 22 15					181
Toro Reef	29 21 10	71 32 25					182
Choros Ids., S.W. pt. of largest	29 15 45	71 34 30					181
Polillao Bay, S.E. corner	29 10 10	71 30 25					182
South Chaneral Bay, S.W. pt.	29 2 0	71 30 30					182
Chaneral Island, S.W. summit	29 1 15	71 35 55					182
Cape Vascunan, islet off (rock)	28 50 0	71 31 30					182
Sarco Cove, middle of beach	28 50 0	71 28 50					183
Huasco, Captain of Port's house	28 27 15	71 16 0	- - -	13 42	8 30	6	183
Lobo Point, outer pitch	28 17 50	71 14 10					185
Herradura de Carrisal, Indng. pl.	28 5 45	71 12 45	- - -	13 30			185
Port Carrisal, island	28 4 20	71 11 15					185
Matamoros Cove, out. pt. S. side	27 54 10	71 9 35					186
Pajonal Cove, S.E. corner	27 43 30	71 4 0	- - -	13 20			186
Salado Bay, Cachos Point, sum.	27 39 20	71 3 45					186
Copiapo, landing place	27 20 0	70 58 45	- - -	13 15	8 30	5	187
Morro of Copiapo, summit	27 9 30	70 58 45					187
Port Yngles, sandy beach in S.W. corner	27 5 20	70 53 0	- - -	13 15			188
Port Caldera, W. pt., lt.-ho.	27 3 0	70 53 0	- - -	13 10			188
Cabeza de Vaca Point, extreme	26 51 5	70 52 0					190
Flamenco, S.E. corner of bay	26 34 30	70 44 30	- - -	12 52	9 10	5	191
Las Animas, sum. over S. pt.	26 23 35	70 44 0					191
Pan de Azucar Islet, summit	26 9 15	70 44 15					192
Ballenita, White-top Islet	25 45 45	70 47 40					193
Lavata, cove near S.W. point	25 39 30	70 44 0	- - -	12 35	9 20	5	193
Point San Pedro, summit	25 31 0	70 41 30					193
Point Taltal, northern extreme	25 24 45	70 35 15					193
Hueso Parado, S. point of cove	25 24 30	70 32 15					194
Point Grande, outer summit	25 7 0	70 30 30					194
Paposo, white head	25 2 30	70 30 5	- - -	12 15	9 40	5	194
Mount Trigo, summit	24 40 0	70 33 0					195
Reyes Head, extreme pitch	24 34 30	70 36 45					195
Jara Head, summit	23 53 0	70 32 45					196
Jaron Mountain, summit	23 52 30	70 28 15					196
Antofagasta Port, custom-house	23 38 35	70 22 19					196
Moreno Mountain, summit	23 28 30	70 34 45					197
Constitucion Cove, shingle pt. on island	23 26 42	70 37 30	- - -	11 50	10 0	4	197
Esmeralda Rock	23 23 0	70 39 0					198
Monte Jorgino, summit	23 15 10	70 36 45					198
Mexillones Mount, summit	23 6 30	70 32 0			10 32	3	198
VI.—COASTS OF BOLIVIA AND PERU.							
Cobija, or La Mar, landing pl.	22 34 0	70 18 5	- - -	11 28	9 54	4	205
Huanillo	22 27 45	70 16 45					207
Algodon Bay, extremity of pt.	22 6 0	70 14 5					207
San Francisco Head, W. pitch	21 55 50	70 11 45	- - -	11 15			208
River Loa, mouth of	21 28 0	70 5 15					209

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	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Chipana Bay, S. point	21 23 0	70 7 0	The survey by				208
Point Lobo or Blanca, out. pitch	21 5 30	70 12 45	Capt. R. FitzRoy,				211
Mount Carrasco, highest sum.	20 58 30	70 6 30	R.N., 1831-1834,				211
Pabellon de Pica, summit	20 57 40	70 11 0	&c.				211
Point Patache, extreme	20 51 5	70 15 15					211
Iquiqui, light on island	20 12 15	70 11 15	- - -	10 42	8 45	5	214
Mexillon Bay, landing place	19 51 0	70 10 30					215
Pisagua, Point Pichalo, extr.	19 37 0	70 16 0	- - -	10 35			216
Point Gorda, western low extr.	19 19 0	70 18 30					216
Cape Lobos, summit	18 45 40	70 22 30					217
Arica, Mole	18 28 5	70 20 45	- - -	10 15	8 0		217
Schama Mountain, highest sum.	17 58 35	70 53 15				5	219
Point Coles, extremity	17 42 0	71 23 15				5	220
Ylo Town, rivulet mouth	17 37 0	71 20 30	- - -	10 25	8 15	6	220
Tambo Valley, Point Mexico	17 10 50	71 49 0					221
Mollendo, flagstaff	17 1 0	72 2 0	- - -	10 35	8 0		222
Islay, Custom-house	17 0 0	72 7 10	- - -	10 37	8 53	7	223
Quilca Cove, W. head	16 42 20	72 27 40	- - -	10 32	8 0	6	226
Pescadores Point, S.W. extr.	16 23 50	73 17 30					227
Atico, E. cove	16 13 30	73 42 15	- - -	10 40	8 53	5	227
Point Chala, extreme	15 48 0	74 27 0					227
Lomas, flagstaff on point	15 33 15	74 51 45	- - -	10 45	8 19	5	228
San Juan, Needle Hummock	15 20 56	75 10 30			5 10	3	229
Point Beware, S.W. extreme	15 8 35	75 22 45					229
Cape Nasca, summit	14 57 0	75 31 45					229
Dona Maria Table, central sum.	14 41 0	75 50 30					230
Independencia Bay, S. point of Santa Rosa Island	14 18 15	76 10 0	- - -	10 50	4 50	4	230
Mount Carretas, summit	14 9 50	76 17 0					231
San Gallan Id., northern sum.	13 50 0	76 28 15					232
Paraca Bay, W. point, N. extr.	13 48 0	76 19 15					232
Pisco, Town, middle	13 43 0	76 14 0	- - -	10 38	4 50	4	232
Chincha Ids., boat slip, N. id.	13 38 20	76 23 5					235
Point Frayles, extreme	13 3 0	76 30 50					236
Asia Rock, summit	12 48 0	76 38 55					236
Chilca Point, S.W. pitch	12 31 0	76 50 30					237
Port Chilca, Rock, summit	12 29 20	76 50 20					237
Chorillos Bay, South point	12 10 30	77 3 50			3 37	6	238
Morro Solar, summit	12 11 30	77 3 15					237
CALLAO, Arsenal flagstaff	12 4 0	77 10 30	- - -	10 30	5 47	4	239
San Lorenzo Island, lighthouse	12 4 0	77 16 0					242
Hormigas Islts., larg. (southern)	11 58 0	77 46 30					244
Pescadores Ids., sum. of large	11 47 10	77 16 50					245
Ancon Bay, Mulatas Point	11 46 50	77 15 0					245
Chancay Head, summit	11 35 55	77 17 35	- - -	10 30			245
Pelado Islet, summit	11 27 10	77 50 0					246
Salinas Hill, summit	11 15 30	77 36 55			4 56		246
Misteriosa Rock	11 16 10	77 40 0					246
Huacho Point, extreme pitch	11 8 45	77 37 15	- - -	10 25	4 45	3	247
Supé, W. end of village	10 49 45	77 43 50			4 50	3	247
Jaguay or Gramadel Hd., W. ex.	10 25 15	78 0 30					248
Guarmey, S. end of sandy beach	10 6 15	78 9 50	- - -	10 15	6 0	2	248
Colina Redonda, summit	9 38 55	78 21 20					249
Mount Mongon, western sum.	9 38 15	78 18 15					249
Casma Bay, inner S. point	9 28 0	78 22 35					250
Samanco Bay, Cross Point	9 15 30	78 29 45	- - -	10 6	6 30	2	250
Ferrol Bay, Chimbote	9 4 40	78 32 1			5 50	2	251
Santa, centre of projecting pt.	9 0 0	78 38 30	- - -	10 3			252
Chao Islet, centre	8 46 30	78 45 0					253
Guanape Islands, sum. of S. id	8 34 50	78 56 10					253
Salaverry, Carretas Hill	8 14 25	78 57 0					254
Truxillo, church	8 7 30	79 1 0					255
Huanchaco Point, S.W. extr.	8 5 40	79 6 0	- - -	9 57			255

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					H. W.	Range.	
	° ′ ″ South.	° ′ ″		° ′	H. M.	FT.	
Macabi Islet, summit	7 49 15	79 27 55	The survey by				257
Malabrigo Bay, rocks	7 42 40	79 25 0	Capt. R. FitzRoy,		5 0	2	257
Pacasmayo Point, N.W. extr.	7 25 15	79 34 25	R.N., 1831-1834;	9 52			258
Lobos de Afuera Island, Fishing Cove on E. side	6 56 45	80 41 10	&c. - - -	9 52			260
Eten Head, summit of cliff	6 56 54	79 51 45					259
Lambayeque, beach opposite	6 46 0	79 57 0	- - -	9 47	4 0	3	260
Lobos de Tierra, S.W. Point	6 29 30	80 50 0					261
Point Aguja, western cliff sum.	5 55 30	81 7 30					262
Sechura Town, church	5 35 0	80 46 45					262
Payta, Silla (or Saddle), S. sum.	5 12 0	81 7 0					263
,, mole	5 5 48	81 7 10	- - -	9 30	3 20	3	263
Parina Point, extreme	4 40 50	81 18 40					264
Cape Blanco, und. mid. high cliff	4 16 40	81 13 45					264
Point Malpelo, mouth of Tumbes River	3 30 40	80 28 30	- - -	8 50	4 0	10	265

VII.—THE COAST OF COLOMBIA, ETC., BETWEEN GUAYAQUIL AND PANAMA.

Santa Clara Island, lighthouse	3 10 40	80 24 34	- - -	8 40	4 0	11	270
Puna Island, Church cross	2 44 6	79 53 11	(* End of H.M.S.	8 27	6 0	11	271
Piedras Point, extreme	2 26 18	79 49 49	*Beagle's* surveys.)				276
Guayaquil, S. end of city*	2 12 24	79 51 24		8 20	7 0	11	272
Point Santa Elena, lighthouse	2 11 25	80 59 0	The survey by	8 30	1 18	8	277
Pelado Islet, summit	1 56 0	80 46 30	Capt. H. Kellett,				277
Salango Bay, watering-place	1 35 14	80 50 37	R.N., C.B., and				278
Plata Isle, East point	1 16 55	81 3 0	Com. Jas. Wood,				278
Cape San Lorenzo, Marlingspike Rock	1 3 30	80 55 0	R.N., 1845—1849.				278
Monte Christo, summit	1 3 40	80 40 0					278
Manta Bay, N. end of village	0 56 46	80 42 47			3 4	6	279
Caracas Bay, Punta Playa	0 35 25	80 24 29					279
Cape Pasado, extreme	0 21 30	80 29 42			3 30	10	280
Jama Point, extreme	0 9 40 North.	80 20 35					278
Pedernales Point, outer rock	0 4 15	80 6 45					280
Cape San Francisco, S.W. extr.	0 40 0	80 7 0					280
Point Galera, North extreme	0 50 10	80 4 45	- - -	7 25			281
Atacames, entrance of river	0 52 30	79 52 20			3 37	13	281
Esmeralda River, Custom Ho.	0 58 20	79 41 25					282
River Santiago, Tola village	1 12 20	79 5 45			3 30	13	283
Point Mangles, S. pt. ent. creek	1 36 0	79 2 35					283
Tumaco, S.W. pt. of El Morro I.	1 49 36	78 44 34	- - -	7 0	2 33	12	283
Point Cascajil, Gallo Island	1 59 0	78 40 0					283
Guascama Point, extreme	2 37 10	78 23 29					283
Gorgona Island, watering bay	2 58 10	78 10 50	- - -	6 30	4 10	10	285
Buenaventura Riv., Basan Pt.	3 49 27	77 10 50			6 0	13	285
Negrillas Rocks, cent. of largest	3 53 0	77 23 30			4 0	13	286
Chirambira Point, N. extreme	4 17 6	77 28 49			4 0	12	287
Cape Corrientes, S.W. extreme	5 28 46	77 32 33	- - -	6 0			288
Port Utria, centre of south. islet	5 58 30	77 20 20			4 0	12	288
Solano Point, North extreme	6 17 55	77 27 30					288
Cupica Bay, ent. of Cupica Riv.	6 41 19	77 29 15	- - -	5 30	3 30	13	289
Cape Marzo, S.E. extreme	6 49 45	77 40 0					290
Port Pinas, N.E. bight	7 34 37	78 9 50			3 15	14	290
Garachine Point, N.E. extreme	8 6 0	78 22 15			4 0	15	290

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BAY OF PANAMA.	° ′ ″	° ′ ″		° ′	H. M.	FT.	
	North.	West.					
Darien Harbour, Graham Point	8 28 50	78 5 40	The survey by	5 10	4 0	24	292
Galera Island, centre	8 11 20	78 46 45	Capt. H. Kellett,				295
San José Bank, Trollope Rock	8 6 40	78 38 50	R.N., C.B., and				293
Isla del Rey, ext. of Cocos Point	8 12 30	78 54 45	Com. Jas. Wood,	5 20			295
Gonzales Island, North head	8 25 30	79 7 15	R.N., 1845—1849.		3 50	16	295
San José Island, Iguana Point	8 18 25	79 7 30					296
Pelado Island, centre	8 37 35	78 42 30					297
Chepillo Island, centre	8 56 32	79 8 0			4 0	16	297
PANAMA, Cathedral, S.E. angle of S. tower	8 57 6	79 32 12	Com. F. M. Green, U.S.N., 1875.				297
,, N.E. bastion	8 56 56	79 31 9	The survey by	5 20	3 23	15to22	297
Flamenco Island, North point	8 54 30	79 31 20	Capt. H. Kellett,				300
Point Chamé, extreme	8 39 0	79 41 30	R.N., C.B., &c.				303
Cape Mala, extreme	7 27 40	79 59 45	- - -	5 45	4 0	16	303
VIII.—SOUTH SHETLAND AND ANTARCTIC LANDS.	South.						
LAURIE ISLAND, Cape Dundas	60 54 0	44 57 0	D'Urville.				—
Saddle Island, W. peak, 1643 ft.	60 43 0	45 10 0	Weddell.				311
Coronation Island, E. summit	60 46 0	45 53 0	,,				310
Inaccessible Island, middle	60 42 0	47 13 0	D'Urville.				—
Cornwallis Island	61 4 0	54 28 0	,,				—
Elephant Island, E. summit	61 6 0	54 45 0	,,				—
Bridgeman Island	62 4 0	56 40 0	Weddell.				313
King George Id., C. Melville	62 2 0	57 30 0	,,				—
Livingston Island, Cape Sheriff	62 28 0	60 28 0	,,				—
Deception I., Pt. Foster, Mt. Pond	62 56 36	60 35 0	Foster.				312
Smith Island, Mount Foster	63 2 0	62 47 0	,,				309
Hoseason Island, C. Possession	63 45 0	61 50 0	,,				—
Biscoe's Range, Pitt Island	65 20 0	65 40 0	Briscoe.				308
Adelaide Island, centre	67 15 0	68 15 0	,,				308
L. Philippe Land, C. Roquemaurel	63 30 20	58 29 16	D'Urville.				314
Astrolabe Island	63 16 0	58 18 26	,,				—
Mount D'Urville	63 28 45	57 41 0	,,				314
Joinville Island, Cape Purvis	63 39 0	55 48 0	,,				314
Cape Seymour	64 13 0	56 32 0	Sir James Ross.				—
Mount Haddington	64 12 0	58 2 0	,,				—
Peter I. Island, 4,000 ft.	68 57 0	90 46 0	Bellingshausen.	35 0			315
Alexander I. Island, N. point	68 51 0	73 9 46	,,				315
		East.					
Balleny Islands	66 44 0	163 11 0	Sir James Ross.				317
VICTORIA LAND, Mount Sabine, 10,000 ft.	71 42 0	169 55 0	,,				318
,, Cape Adair	71 18 0	170 45 0	,,				318
,, Possession Id.	71 56 0	171 7 0	,,				319
,, Franklin Id.	78 6 0	168 12 0	,,				320
,, Mount Erebus	77 33 0	166 58 0	,,				320
ANTARCTIC LANDS, Disappointment Bay	67 4 30	147 30 0	Wilkes.				322
,, Adelie Land, C. Robert	66 21 15	133 15 30	D'Urville.				322
,, ,, Pt. Geology	66 34 35	135 39 30	,,				—
,, ,, C. Discovery	66 35 48	136 29 0	,,				—
,, ,, Cape Jules	66 37 0	136 5 0	,,				—
,, Clarie Coast	64 31 0	128 23 30	,,	West.			323
,, Sabrina Land	65 20 0	121 8 0	Balleny.	32 0			323
,, Knox's High Land	66 0 0	106 18 42	Wilkes.				323
Nimrod Islands (?)	56 30 0	158 30 0	Elbech, 1828.				325
Dougherty Island, 1841	59 21 0	119 7 0	Keates, 1859.				324

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					H. W.	Range.	
	° ′ ″	° ′ ″ East.		° ′	H. M.	FT.	
Macquarie Island, S. point	54 55 0	158 56 0	Various.				326
Bishop and his Clerk	55 16 0	158 55 0	„				327
Judge and his Clerk	54 22 0	159 10 0	„				327
Campbell I., Perseverance Har.	52 33 26	169 8 41	Sir James Ross.	18 45	Noon.	3½	327
Auckland Isles; Enderby Id.-							
Sarah Harbour	50 32 30	166 12 34	„	17 30	Noon.	3	333
„ „ E. pt.	50 30 0	166 19 0	„				333
„ Bristow Rock	50 19 0	166 13 0	Bristow.				334
„ South Cape	50 56 38	166 12 4	D'Urville.				
Antipodes Islands	49 42 0	178 43 0	Barley, &c.				335
Bounty Island	47 50 0	179 0 0	Norman, &c.				336
Chatham Islands.		West.					
Ware Kauri, Point Allison	43 47 30	176 50 0	Ch. du Fournier.				338
Wangaroa Bay, Gordon Point	43 49 0	176 39 50	Dr. E. Dieffenbach.		6 50	2½	342
Waitangi Harbour, village	43 56 30	176 25 0	S. P. Smith, &c.			6	341
Cape Eveque or Beaufort	44 7 0	176 36 45	„				340
Cape Young	43 41 0	176 35 0	„				
Rangi-tutahi or Two Sisters I.	43 33 40	176 46 30	„				343
Western Reef, W. point	43 54 30	177 0 0	„				343
Sentry or Solitaire Reef	44 12 0	176 32 20	„				339
Pitt Id., or Rangi-haute, S. pt.	44 21 0	176 12 15	„				343
Star Quay Reef	44 13 20	175 58 0	„				344
Bertier Rocks	43 57 30	175 48 0	„				344
IX.—NEW ZEALAND.							
North Island.		East.					
Three Kings I., N.E.I., N.E. ex.	34 6 20	172 9 45	The survey by	12 55	8 0	7 spr.	351
C. Maria Van Diemen, C. Islet	34 28 30	172 38 40	Captain J. Lort		8 0	7	351
North Cape, Cape Islet	34 25 7	173 4 30	Stokes, in H.M.S.		7 0	7	352
Parenga-renga Harb., Coal Pt.	34 31 0	173 1 50	*Acheron*, & Capt.		7 54	7	352
Ohora River, Repi-repi Point	34 50 0	173 10 10	Byron Drury, in		8 48		353
Rangaounou: Tekotiatia Pt.	34 53 12	173 18 34	H.M.S. *Pandora*,		7 44	7	353
Monganui Harbour, White's Pt.	35 0 20	173 33 35	1848—1855.		8 15	7	354
Wangaroa Harbour, Peach Id.	35 1 44	173 46 44		13 12	8 15	7 spr.	356
Cavalli Ids., Great I., N.E. ext.	34 59 30	173 58 45			8 0	7	356
Bay of Islands, Motu Mea Islet	35 17 0	174 7 2			7 15	6 to 9	357
„ „ C. Bret (Piercy I.)	35 10 30	174 21 10					363
Wangaruru Harbour, Grove Pt.	35 23 48	174 22 20			7 10	7 to 9	364
Poor Knights Islands, N. Id., North point	35 28 30	174 44 40		13 25			366
Tutukaka Harbour, N. head	35 37 54	174 34 20			7 0	7 to 9	366
Bream Head, extreme	35 52 15	174 37 30					367
Wangari Harbour, Lort Point	35 51 9	174 32 10			7 0	7 to 9	367
Moko Hinou Ids., lighthouse	35 55 15	175 8 47					388
Great Barrier Id., Aiguilles Pt.	36 1 15	175 26 30		13 32			386
„ „ Cape Barrier, ex.	36 21 50	175 33 0				7 to 10	388
Rodney Point, extreme	36 16 40	174 51 10					369
Kawau Id., Bon Accord Harb., Momono Jetty	36 26 0	174 50 15			6 30	7 to 10	371
Auckland Harbour, Depot Pt.	36 50 5	174 49 10			7 5	9 to 11	379
Coromandel Harb., Tuhuia Id.	36 48 35	175 25 30		13 43	7 0		384
Castle Hill, summit, 1,610 ft.	36 48 25	175 35 0					384
Cape Colville, North point	36 28 20	175 22 0					383
Cuvier Island, highest peak	36 26 30	175 48 20					389
Mercury Islands, East Island, (*Wakahau*), North Cliff	36 36 15	175 58 20					389
Mercury Bay, Huki-huki pah, entrance of Mangrove River	36 48 44	175 44 36			7 21	5 to 7	390

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	° ′ ″	° ′ ″		° ′	H. M.	FT.	
Alderman Islands, East Island	36 56 15	176 7 40	The survey by				391
Kati-Kati River, North head	37 26 40	176 0 30	Captain J. Lort				392
Mayor Id., highest peak, 410 ft.	37 15 40	176 15 15	Stokes, in H.M.S.		7 45		392
Tauranga Harbour, Monganui Mount, apex 860 ft.	37 36 25	176 11 10	*Acheron*, & Capt. Byron Drury, in	13 58	7 10	4½ to 6	393
Astrolabe Rock, centre	37 30 45	176 26 45	H.M.S. *Pandora*,		7 30		395
Motiti Island, North point	37 34 40	176 25 30	1848—1855.				394
Plate Id. (*Motunau*), cen. 166 ft.	37 38 15	176 34 0					395
Maketu, Town point	37 43 0	176 28 30					394
Whale I., or Motu Hora, highest peak, 1,167 feet	37 50 15	176 59 30					396
Opotiki River, Mission House	37 58 0	177 18 0			7 0	7 spr.	396
White Island, summit, 863 feet	37 30 0	177 11 45			7 30		396
Mt. Edgcumbe, E. sum. 2,575 ft.	38 6 0	176 45 0	- - -	14 0			395
Tehaka Point, outer extreme	37 42 45	177 41 45			6 30	9	—
Runaway Cape, extreme	37 30 45	178 0 30			9 16	7	397
Hicks B., Motakawa or Long Pt.	37 32 20	178 21 15			9 0	7	398
East Cape, E. Cape Islet, 420 ft.	37 40 0	178 36 5	- - -	13 47	8 55	7	398
Open Bay, North point	37 58 20	178 23 10					399
Tolago Bay, Motu-Heka Islet	38 20 50	178 21 10			8 50		400
Gable-end Foreland, WhiteGab.	38 31 45	178 18 20			8 0		400
Ariel Rocks, centre of reef	38 43 40	178 18 30			8 0		402
Poverty Bay, Young Nick's Hd.	38 45 0	177 59 25	- - -	14 6	6 5	5 to 7	401
Mahia Penin., Table Cape, ex.	39 6 0	178 1 0					402
„ Portland Id., S. ex., ltho.	39 18 0	177 53 0			7 45		403
Hawke Bay, Ahuriri Harbour, Maori Pah	39 28 44	176 55 10			7 50	3 spr.	404
Hawke Bay, Long Pt. Anchorage, Moemoto Head	39 8 0	177 51 30					404
Cape Kidnappers, extreme	39 38 0	177 7 40	- - -	14 30			406
Cape Turnagain, East extreme	40 29 30	176 38 30			7 0		406
Castle Point, extreme	40 54 30	176 14 20					406
Flat Point, extreme	41 15 10	175 58 30					406
Cape Palliser, extreme	41 36 50	175 17 0	- - -	15 4	6 0		407
Reef Point, extreme	35 10 30	173 5 30			8 45	7	408
Herekino, South point	35 18 10	173 11 5			9 0		408
Wangape, North head	35 22 20	173 13 45			9 10		408
Hokianga Riv., flagstaff at ent.	35 32 5	173 22 55	- - -	13 20	9 45	10 spr.	408
Monganui Bluff, the bluff, 2046 ft.	35 46 20	173 34 42			9 45		411
Kaipara Harbour, watering pl., Wairoa branch	36 19 35	174 11 30			10 50	8 to 11	413
Kaipara Harb., S. hd. (Okaka)	36 25 10	174 14 33	- - -	13 35	10 55	8 to 10	413
Manukau Har., Onehunga, S. pt.	36 56 15	174 48 0			10 50	9 to 14	420
„ Paratutai, N. hd., flagstaff	37 3 0	174 32 10			9 30	10 to 13	416
Waikato River, Maraitai village	37 24 20	174 47 20			9 30	9 to 12	420
Whaingaroa Harb., S. ent. pt.	37 46 22	174 53 15			9 50	12 spr.	421
Aotea Harbour, S. head	37 59 35	174 51 0			10 0	12 to 9½	422
Gannet Island, summit 80 feet	37 57 0	174 35 0					423
Kawhia Harbour, South head	38 4 50	174 49 0	- - -	14 6	9 30	12	423
Albatross Point, North extreme	38 6 10	174 43 30					423
New Plymouth, flagstaff	39 3 35	174 5 31			9 30	9 to 12	424
COOK STRAIT.							
Mount Egmont, sum., 8,270 ft.	39 18 0	174 4 55					427
Cape Egmont, lighthouse	39 16 47	173 46 10	- - -	14 24	9 30		427
Taourakira Head, extreme	41 26 5	174 56 5					429
Port Nicholson, Pencarrow Lt.	41 21 40	174 52 0					430
„ „ Pipitea Point	41 16 40	174 47 53					433
Cape Terawiti, extreme	41 17 15	174 38 15					435
Mana Island, Anchorage Point	41 5 51	174 48 5			7 0	6 to 8	435
Kapiti Island, Long Point	40 50 0	174 58 25	- - -	14 56			436
Manawatu River, N. entr. pt.	40 27 10	175 14 40			10 0	6 to 8	438

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Rangitiki River, N. entrance	40 17 30	175 14 45	The survey by				438
Wanganui River, North head	39 57 20	175 1 0	Captain J. Lort		10 15	6 to 8	438
Cape Farewell, extreme	40 29 50	172 42 10	Stokes, in H.M.S	14 42	9 0	10to14	441
Farewell Spit, Bush-end Lt.-ho.	40 33 20	173 2 0	*Acheron*, & Capt.				442
Massacre Bay, Tasman Corner,			Byron Drury, in				
Abel Head	40 31 52	172 45 10	H.M.S. *Pandora*,		8 45	9 to 13	442
Astrolabe Rd., Adèle I., N.E. pt.	40 58 55	173 5 20	1848—1855.				444
Nelson Haven, Magazine on Boulder Bank	41 15 35	173 16 58	- - -	14 58	9 50	10to14	444
Croisilles Harbour, Shingle Pt. on North shore	41 3 15	173 43 20					446
Current Basin, Sandy B. Cross Pt	40 56 20	173 52 15			10 0	5 to 12	447
Stephens Island, North end	40 40 0	174 1 10					447
D'Urville Island, Port Hardy, East arm, Wooding Point	40 46 35	173 55 0			9 55	12	448
Pelorus Sd., Sentinel Rk., off ent.	40 53 5	174 9 40	- - -	14 54	9 35	7 to 11	449
Guards Bay, Titirangi Bay, cliff at head	41 1 0	174 9 30					450
Cape Lambert, extreme	40 59 15	174 15 0					450
Port Gore, hd. of Melville Cove	41 1 55	174 12 18			9 0	6 to 8	450
Cape Jackson, extreme	40 59 50	174 20 0					450
Queen Charlotte Sound, Motuara, South summit	41 5 48	174 17 30	- - -	15 0	8 50	6 to 8	451
Tory Channel, White Rocks, Jackson's Bay	41 12 45	174 18 20			8 15	6 to 8	454
Brothers Islets, N. Id., ltho.	41 6 30	174 27 15					453
Wellington Head, sum. 2190 ft.	41 11 15	174 23 0	- - -	15 3			453
Port Underwood, Bell's Cove, Flag Point	41 20 28	174 9 20			6 10	6 to 8	454
Wairau River, entrance, N. side	41 30 0	174 4 50					455
MIDDLE & STEWART'S ISLANDS.							
Cape Campbell, lighthouse	41 43 15	174 18 30	- - -	15 11	6 0		455
Waipapa Point, extreme	42 10 15	173 58 30					457
Kaikora Peninsula, East Head	42 26 30	173 43 50			5 30		458
Amuri Bluff, extreme	42 34 10	173 32 30					459
Waiau-ua River, entrance	42 47 10	173 23 10					459
Sail Rock, centre	42 58 15	173 14 30					460
Pegasus Bay, Motunau, or Table Island	43 4 0	174 6 0	- - -	15 35	4 0		460
Port Lyttelton, Custom-house	43 36 42	172 44 17			4 20	4 to 7½	462
Pigeon Bay, Settlement Cove	42 40 41	172 54 8					464
Banks Peninsula, East Head	43 46 0	173 9 0			3 45		464
Akaroa Harbour, ltho. at entr.	43 54 0	173 0 20	- - -	15 48	3 24	6 to 8	465
Ashburton River, N. entr. pt.	44 4 50	171 49 30					—
Timaru, flagstaff, landing place	44 23 0	171 17 20					466
Waitangi River, N. entr. head	44 54 50	171 12 10					468
Moerangi Bay, Look-out bluff	45 16 15	170 53 50	- - -	16 14			469
Waikouaiti Bay, Jones Head	45 37 20	170 43 0					469
Otago Harbour, Tairoa Hd. ltho.	45 46 55	170 44 58	- - -	16 16	2 50	5 to 7	471
Cape Saunders lighthouse	45 53 15	170 45 30			2 45		474
Taieri Island, East point	46 3 45	170 14 40					—
Quoin Point, extreme	46 9 30	170 13 0					474
Nugget Point, lighthouse	46 27 0	169 51 0					474
Molyneux Bay	46 24 5	169 48 49			3 0	6 to 8	475
Long Point, ext. of cliffs, 275 ft.	46 35 15	169 36 15	- - -	16 33			475
Chasland's Mistake, ext. of point	46 39 0	169 21 30					475
Brothers Point, outer islet	46 40 15	169 13 35					475
Slope Point, extreme	46 41 0	169 2 30					475
Ruapuke I., Obs. Bluff, N.E. hd.	46 46 42	168 33 55	- - -	16 30	1 0	6 to 8	477

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Awarua, or Bluff Harbour, point near anchorage	46 36 17	168 21 55	The survey by Captain J. Lort Stokes, in H.M.S. *Acheron*, & Capt. Byron Drury, in H.M.S. *Pandora*, 1848—1855.		1 18	6 to 8	479
New River (*Orete*), Bombay Rk.	46 31 20	168 17 35			12 10	4 to 8	481
Centre Id., lighthouse	46 28 30	167 52 30					482
Tewaewae Bay, Pahia Point	46 20 40	167 43 15		16 14			483
Solander Island, sum., 1,100 ft.	46 36 0	166 55 0					476
Green Islets, outer islet	46 15 0	156 49 0					477
Stewart I., Black Rock Pt. ex.	46 41 30	167 53 40	- - -	15 28			485
„ Port William, Howell's ho.	46 50 30	168 6 30			12 45	6 to 8	485
„ Paterson's Inlet, Glory Cove	46 58 30	168 10 50			1 10	6 to 8	485
„ Port Adventure, White Beach, S. end	47 3 52	168 11 53	- - -	16 33	12 20	6 to 8	486
„ Lords River, first cove	47 7 11	168 9 34			1 20		487
„ Port Pegasus, cove abreast Anchorage Island	47 11 40	167 41 47			11 50	6 to 8	487
Traps Rks., N. reef, N.W. rk. 5 ft.	47 22 15	167 55 15	- - -	16 35			488
„ S. reef, centre	47 33 0	167 52 45			12 0		488
Wedge Island, centre	47 13 30	167 21 30			12 0		488
Mason Bay, North Ernest Id., South Cove	46 57 9	167 42 5			11 10	6 to 8	488
Codfish Id., N.W. ex., high rk.	46 45 45	167 37 45	- - -	16 20			488
Snares Islands, S.W. island	48 6 43	166 28 40	- - -	16 42			489
Preservation Inlet, Cuttle Cove	46 4 30	166 40 38	- - -	16 0	11 20	4 to 8	492
„ Puysegur Point, lighthouse	46 10 0	166 38 0					492
Table Rock, centre, 20 ft. high	46 6 10	166 31 50					492
Chalky Inlet, N. Port, Little Id.	45 59 2	166 35 45			11 5	4 to 8	494
Cape Providence, extreme	46 1 0	166 28 30			11 15		494
West Cape, extreme	45 54 20	166 26 30					494
Dusky Bay, or Sound, Five Fingers Point	45 44 15	166 27 45			11 15	6 to 10	494
„ „ Duck Cove, Observation Rock	45 43 42	166 39 37			10 50	6 to 10	495
Breaksea Island, N.E. point	45 34 45	166 38 45	- - -	15 50	11 15		496
Daggs Sound, Observation Hd., North Arm	45 23 7	166 52 30			11 30	6 to 8	496
Thompson Sound, Deas Cove	45 11 43	166 58 10			11 30	6 to 8	497
Nancy Sound, Heel Cove, First Reach	45 11 10	167 6 10					497
Caswell Sound, Green Pt. Islet	45 1 43	167 18 15					497
Bligh Sound, Bounty Cove	44 52 56	167 32 20	- - -	15 43	10 45	6 to 8	498
Milford Sound, Anita Bay	44 35 0	167 47 10					499
Awarua River, entrance	44 18 0	168 4 0					—
Cascade Point, N. extreme	44 0 30	168 22 30					500
Jackson Bay, huts in S.W. corner	43 58 35	168 37 41	- - -	15 35			500
Taumaki, or Open-Bay Islets, S.W. island, centre	43 51 40	168 53 45					500
Arnott Point, extreme	43 45 0	169 10 0					501
Mount Cook, highest pk. 13,200 feet	43 36 30	170 12 10					501
Abut Head, extreme	43 7 0	170 17 0					502
Bold Head, extreme	42 58 0	170 41 30	- - -	15 30			502
Hokitika or Brunner R., entr.	42 45 0	170 57 0			9 39	8½ to 9	503
Grey River, entrance	42 28 30	171 11 15					504
Perpendicular Pt., Centre Cliff	42 8 0	171 19 0					504
Cape Foulwind, extreme	41 45 30	171 34 30	- - -	15 12			505
„ Three Steeples (N.)	41 43 20	171 35 15					505
Buller River, entrance	41 46 15	171 45 0					505
Wanganui Inlet, entrance	40 34 45	172 33 0					506
Cape Farewell, extreme	40 29 50	172 42 10	- - -	14 42	9 0	10 to 14	507

THE ISLANDS.

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X.—ISLANDS BETWEEN LATITUDES 20° & 40° S.					
Juan Fernandez, Fort Juan Bautista	Fernandez, 1563.	33 37 45	78 53 0	King.	510
Masafuera, summit	,,	33 48 30	80 51 10	Du Petit Thouars.	512
St. Ambrose Island, W. point		26 19 45	79 49 45	Gormaz.	513
St. Felix Island, landing-place		26 16 46	80 0 15	,,	513
Sala-y-Gomez Id. (Gwyn Rock)	Gomez, 1793.	26 27 46	105 20 8	Beechey.	514
Easter Id., Perouse Pt., Cook B.	Roggewein, 1721.	27 8 46	109 24 36	,,	519
Oparo or Rapa Id., Ahurei B.	Vancouver, 1791.	27 35 46	144 10 51	Quentin, 1867.	520
Nielson (Osborne, Lancaster) Rf.	Stutchbury, 1827.	27 0 0	146 16 45	Stutchbury.	522
Bass Isles	Bass.	27 55 30	143 28 20	French.	522
TUBUAI OR AUSTRAL ISLANDS.					
Vavitao Island or Ravaivai	Broughton, 1791.	23 42 0	147 50 0	Fren. Officers, 1874.	523
Tubuai Island, North end	Cook, 1777.	23 21 45	149 35 35	Delamarche.	523
Rurutu, or Oheteroah, 1,300 ft.	,, 1769.	22 29 0	151 20 25	Bruce and Powell.	524
Rimitera Island, 300 ft.	Henry.	22 45 0	152 55 0	Fren. Officers, 1874	525
Sands or Hull Islands	Sands, 1845.	21 47 0	154 51 0	,,	525
COOK'S ISLANDS.					
Mangaia, or Mangea	Cook, 1777. [1814.	21 57 0	157 55 0	Cook, &c.	526
Rarotonga, N.W. point	*The Seringapatam*,	21 11 35	159 47 0	Bethune, &c.	527
Atiu, or Wateeo, centre	Cook, 1777.	19 58 0	158 4 23	,,	528
Takutea, or Wenooaette	,,	19 51 0	158 16 0	Cook.	529
Mitiero, centre	Dibbs, 1823.	19 49 45	157 34 0	Bethune.	529
Mauki, or Parry Island	,,	20 7 0	157 11 0	,,	529
Hervey Islands	Cook, 1773.	19 18 0	158 54 0	,,	530
Aitutaki, or Whytootaké	Bligh, 1798.	18 52 0	159 41 0	Bligh.	530
Palmerston Island, W. islet	Cook, 1777.	18 5 50	163 10 0	*Le Bucephale.*	531
New Island (doubtful existence)		24 20 0	159 30 0	Dutaillis, Hamond.	531
Haymet Rocks	Haymet, 1863.	27 11 0	160 13 0	Haymet.	531
L'Orne Bank, 16 fathoms	*L'Orne.*	27 42 0	157 44 0	*L'Orne.*	531
Maria Theresa Reef, 1843.		37 0 0	151 13 0	Charts.	532
Jupiter Reefs	Ringe.	26 37 0	150 15 0	Ringe.	532
Beveridge Reef, Lagoon Reef, K. George Reef, Middleton Reef	Nicholson, 1833.	20 2 0	167 49 0	Sir E. Belcher.	532
Harans Reef (?)	Harans, 1842.	21 32 0	168 54 30	Harans.	532
Thompson Reef (?)	Thompson, 1854.	22 47 0	171 48 30	Thompson.	532
Buffon Reef	*The Buffon*, 1880.	20 39 0	169 58 0	*The Buffon.*	533
TONGA OR FRIENDLY ISLANDS.					
Eooa, or Middelburg, N. part		21 16 0	174 55 0	Charts.	535
Catto Island	Tasman, 1643.	21 30 0	175 1 0	,,	535
Tonga-tabu, Panghai-motu Id.		21 7 0	175 13 0	Cook. D'Urville, &c.	537
North Star Reef		20 50 0	174 35 0	Charts.	540
Namuka (Annamooka) Island		20 15 0	174 50 0	,,	540
Culebras Bank (?)	Maurelle, 1781.	20 22 0	175 22 0	,,	540
Hapai Ids., Lifuka, N.W. side		19 48 12	174 20 0	Worth.	541
Tofoa Island, 2,800 ft.		19 45 0	175 3 0	D'Urville.	542
Kao Island, 5,000 ft.		19 41 35	174 59 50	,,	542
Disney Shoal	Disney, 1841.	19 15 0	173 40 0	Disney.	543
Home Shoal		19 4 0	174 39 0	Charts.	543

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Metis Rock		19 11 0	174 49 0	Charts.	543
Vavau, Port Refuge, Neafu village		18 38 20	173 55 0	Home.	545
Latte or Lette Island, 1,790 ft.		18 45 15	174 40 0	Charts.	545
Amargura, Fanoualei, or Gardner Island	Maurelle, 1643.	18 2 0	174 16 0	Worth.	546
Pylstaart Island (Sola Island)	Tasman. 1643.	22 24 45	176 2 0	Freycinet.	547
Pelorus Reef	H.M.S *Pelorus*, 1861	22 52 15	176 27 50	*The Pelorus.*	547
La Rance Banks, $3\frac{1}{4}$ fathoms	Chevalier, 1872.	24 18 0	176 1 0	Chevalier.	547
Calinon Reef	M. Calinon.	20 21 0	179 24 0	Erskine.	549
Ono Islands		20 39 0	178 40 0	Bellingshausen.	548
Simonoff Reef, centre	Bellingshausen.	21 1 39	178 48 55	Charts.	548
Michaeloff Reef		21 0 9	178 43 11	,,	548
Minerva Reefs, S. Reef	Nicholson, 1818.	23 56 22	179 4 57	Denham, 1854.	549
,, ,, N. Reef	Bethune, 1842.	23 37 19	178 49 39	,,	549
Kermadec Islands.					
Raoul or Sunday Id., W. Bay	D'Entrecast., 1793.	29 15 30	177 54 52	Denham.	550
Macauley Island, 750 ft.	Watts, 1788.	30 16 0	178 32 0	Wilkes.	551
Curtis Island	,,	30 36 0	178 37 20	D'Urville.	551
Olozenga Rock	Ranzon, 1876.	29 48 0	176 45 0	Ranzon.	551
L'Esperance (Brind's or French) Rock	D'Entrecasteaux.	31 27 30	178 55 0	Charts.	551
Havre Rock		31 18 0	179 0 0 East.	,,	551
Somme Shoal		30 55 0	178 5 0	French Charts.	552
Vibilia Rock	*The Vibilia*, 1877.	31 50 0	178 20 0	*The Vibilia.*	552
Conway Reef, 1838.		21 44 48	174 40 0	Charts.	552
Matthew Island, 465 ft.	Gilbert, 1788.	22 20 12	171 20 30	Denham.	553
Hunter Island	Fearn, 1798.	22 24 2	172 5 15	,,	553
La Brillante Shoal, $6\frac{1}{2}$ ft.	Dubouzet, 1847.	23 12 17	170 4 15	Krabbe, &c.	553
Walpole Island	Butler, 1794.	22 38 7	168 56 45	Denham.	554
O'Neill Bank	*L'Orne*, 1874.	22 26 0	168 56 0	*L'Orne.*	554
Durand Reef	Butler, 1794.	22 2 25	168 39 34	Denham.	554
Norfolk Id., Mt. Pitt, 1,050 ft.	Cook, 1774.	29 1 0	167 56 0	Chart.	556
,, Nepean Island		29 4 0	167 58 0	,,	557
New Caledonia.					
Isle of Pines, Ngao Peak, 880 ft.	Cook, 1774.	22 39 20	167 28 0	Denham & French Officers.	561
,, ,, S. Islet, Ami		22 46 0	167 34 40		561
Uamæo B., Port Victoria, Pine I.		22 31 0	167 25 5	,,	563
Queen Charlotte Cape, Goro		22 19 0	167 1 20	French Officers.	564
Cape Ndua, extreme		22 24 0	166 56 15	,,	564
Woodin Passage, Ia Peak		22 22 10	166 45 30	,,	565
Mount D'Or, 2,543 ft.		22 16 0	166 36 5	,,	566
Nouméa, N.W. part		22 16 15	166 27 10	,,	569
Bulari Pass, Amédée Id. lthe.		22 28 44	166 28 40	,,	567
Port St. Vincent, Ducos Id., N.W. part		21 59 20	166 2 10	,,	573
Cape Goulvain		21 33 15	165 15 0	,,	574
Cape Tonnerre		20 24 0	164 7 45	,,	576
D'Entrecasteaux Rf., Surprise I.	D'Entrecasteaux.	18 31 0	163 8 0	,,	579
,, ,, N. Huon Id.		18 2 0	162 50 0	,,	578
Balade, block-house		20 18 0	164 28 45	,,	585
Cape Colnett		20 30 0	164 46 0	,,	585
Yengen, the Towers, S.E. rock		20 41 0	164 58 30	,,	584
Port Kanala, Cape Dumoulin		21 24 30	165 58 15	,,	583
Cape Coronation		22 2 30	166 52 0	Cook.	581

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Loyalty Isles.			East.		
Mare or Britannia Id., S. point	Butler, 1800.	21 42 0	168 0 0	D'Urville.	587
——, Castle or Desgraz Point		20 37 0	167 48 0	,,	588
Lifu or Chabrol, Pine or W. cape		21 9 30	167 21 0	Dutaillis.	588
——, Sandal Bay, Morne Bay		20 50 0	167 2 0	,,	589
Uea or Halgan Id., C. Gervaize		20 43 0	166 34 0	,,	589
Beaupré Islands		20 18 0	165 59 0	D'Urville.	591
Astrolabe Reef, North point		19 40 20	165 26 24	,,	591
Simpson Reef (?)	Simpson, 1846.	21 30 0	166 50 0	Simpson.	587
Petrie (*Betsey*) Reef, N. point	Petrie, 1835.	18 31 0	164 26 0	Petrie.	591
Ross Bank, 400 fathoms (?)	Ross, 1841.	33 32 0	167 40 0	Sir James Ross.	—
XI.—LOW ARCHIPELAGO, OR PAUMOTU GROUP.			West.		
Ducie Island	Edwards, 1791.	24 40 20	124 48 0	Beechey.	595
Elizabeth Island, or Henderson	Henderson.	24 21 20	128 19 0	,,	596
Pitcairn Island, Adamstown	Carteret, 1767.	25 3 37	130 8 23	,,	600
Oeno Island, N. point	Henderson. 1819	24 1 20	130 41 0	,,	600
Timoe, or Crescent Island	Wilson, 1797.	23 20 29	134 35 8	,,	600
Manga Reva, or Gambier Ids., Mount Duff, 1,248 ft.	,,	23 7 58	134 55 21	,,	601
Morane, or Cadmus Island		23 8 0	137 8 30	*La Mégère.*	603
Marutea, or Lord Hood Island	Edwards, 1791.	21 30 50	135 33 19	Beechey.	603
Maria, or Moerenhout	Ebrill, 1832.	21 59 0	136 12 0	Denis.	603
Amphitrite or Actæon Islands, S.E. point	,, 1833.	21 30 0	136 23 0	Biddlecombe.	604
Tureia, or Carysfort Island	Edwards, 1791.	20 44 53	138 26 0	Beechey, &c.	605
Fangataufa, or Cockburn Id.	Beechey, 1826.	22 12 30	138 42 0	,,	605
Mururea, or Osnaburgh Island	Carteret, 1767.	21 50 32	138 44 28	,,	605
Tematangi, or Bligh Island	Bligh, 1792.	21 37 45	140 40 15	,,	606
Gloucester Isles, Margaret Id.	Carteret, 1767.	20 42 15	143 6 0	Wilkes, &c.	606
Anuanuraro, or San Miguel Arcangel	Quiros, 1606.	20 25 0	143 31 0	,,	607
Hereheretue, or San Pablo	,,	19 52 0	145 0 0	,,	607
Vana-Vana, or Barrow Island	Beechey, 1826.	20 45 7	139 3 9	Beechey.	607
Pinaki, or Whit Sunday Island	Wallis, 1767.	19 23 40	138 40 0	,,	608
Reao, or Clermont Tonnerre Id.	Duperrey, 1822.	18 33 42	136 20 0	Duperrey.	608
Pukaruha, or Serle Island	Wilson, 1797.	18 22 30	136 58 30	Beechey, &c.	608
Vairaatea, or Egmont Island	Wallis, 1767.	19 22 59	139 12 3	,,	609
Ahunui, or Byam Martin Id.	Beechey, 1826.	19 40 22	140 24 28	,,	609
Akiaki, Lanciers, or Thrum Cap Island	Bougainville, 1768.	18 30 8	139 11 30	,,	610
Nukutavake, or Queen Charlotte Island	Wallis, 1767.	19 17 40	138 42 28	,,	608
Vahitahi, Four Facardins, or Lagoon Island	Bougainville, 1768.	18 42 26	138 50 0	,,	610
Tatakoto, or Narcissus Island	Bonecheo, 1774.	17 20 0	138 23 0	Duperrey.	610
Amanu, or Moller Island	Bellingshausen 1829	17 43 0	140 37 0	Bellingshausen.	610
Hao, Harpe, or Bow Id., N. end	Bougainville, 1768.	18 5 45	140 59 11	Kulczycki.	611
Nengo-Nengo, William Henry, or L'Ostange Island	Wallis, 1765.	18 43 0	141 42 0	Duperrey.	612
Reitoru, or Bird Island	Cook, 1769.	17 48 0	143 7 0	Beechey.	613
Hikuero, or Melville Island	Beechey, 1826.	17 35 28	142 35 55	French Officers.	613
Taueree, or St. Simon Island	Bonecheo, 1772.	17 22 20	141 24 0	Beechey.	613
Fakaina, or Predpriatie Island	Kotzebue, 1824.	15 58 18	140 5 0	Kotzebue, &c.	613
Henuake, or Dog Island	Le Maire, 1616.	14 55 40	138 47 36	Wilkes.	614
Disappointment Ids., Napuka	Byron, 1765.	14 9 30	141 17 50	,,	614
Angatau, or Araktcheeff Id.	Bellingshausen 1820	15 51 20	140 50 50	Kotzebue.	614
Takume, or Wolkhonsky Id.	,,	15 44 20	142 8 42	French Officers.	615
Raroia, or Barclay de Tolly, vil.	,,	16 1 25	142 27 42	Lejeune.	615
Nigeri, or Nihiru Id., S.W. pt.	,, 1819	16 44 29	142 53 39	French Officers.	615
Taenga, Holt, or Yermaloff Id., pass at S.W. end	Turnbull, 1803.	16 19 53	143 11 1	,,	615

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Marutea, or Furneaux Id., N.E. pass	Cook, 1773.	16 58 0	143 5 5	French Officers.	615
Tahanea, or Tchitchagoff Id., S.E. pt.	Bellingshausen1820	16 56 48	144 34 7	,,	616
Anaa, or Chain Island, N. pt.	Cook, 1769.	17 20 20	145 30 58	,,	616
Raeffsky Islands, Tepoto, N. pt.	Bellingshausen1820	16 42 0	144 5 0	,,	617
Haraiki, St. Quentin or Croker I.	Bonecheo, 1772.	17 26 0	143 26 0	,,	617
Motutunga, or Adventure Id.	Cook, 1773.	17 3 15	144 24 44	,,	617
Makemo, or Philip Id., village	*The Margaret*, 1803.	16 25 7	143 55 11	,,	617
Katiu, or Saken Id., S.W. pass	Bellingshausen1822	16 22 36	144 27 46	,,	618
Faaiti, or Miloradowitch Island	,, 1819	16 41 32	145 22 17	,,	618
Fakarava, or Wittgenstein	,,	16 4 0	145 39 0	,,	618
Raraka Island, S.E. point	Ireland, 1831.	16 14 35	144 50 24	,,	619
Taiaro, Tai-a-ra, or King's Id.	FitzRoy, 1835.	15 43 15	144 38 38	,,	619
Aratika, or Carls-Hof Island	Roggewein, 1722.	15 26 0	145 39 46	Wilkes.	619
Kawahi, Cavahi, or Vincennes I.	FitzRoy, 1835.	15 48 15	145 3 34	,,	620
Palliser or Schadelyk Ids., Toau, or Elizabeth Island	Roggewein, 1722.	15 58 0	145 48 0	FitzRoy.	620
Kaukura, or Aura Island		15 43 0	146 50 36	Kotzebue.	621
Apatiki, or Hagemeister Island	Hagemeister, 1830.	15 18 0	146 15 0	,,	621
Arutua, or Rurick Island	Kotzebue, 1815.	15 10 0	146 47 0	Wilkes.	621
Tikei, or Romanzoff Island	,,	14 57 20	144 35 0	Kotzebue.	621
King George Islands, Tiookea, or Takaroa, N. point	Le Maire, 1616.	14 27 0	144 58 0	Wilkes.	621
Manihi, or Waterlandt Island	,,	14 26 22	146 4 20	,,	622
Oahe, Ahii, or Peacock Island		14 35 0	146 27 0	,,	622
Rangiroa, Vliegen, Dean Island, or Nairsa, W. point	Schouten, 1616.	15 5 15	147 58 34	,,	622
——————, E. point		15 18 7	147 15 13	Delamarche.	622
Makatea, or Aurora Island	Roggewein, 1722.	15 45 39	148 13 15	Wilkes.	623
Tikahau, or Krusenstern Island	Kotzebue, 1815.	15 0 0	148 41 0	Kotzebue.	624
Matahiva or Lazareff, W. end	Bellingshausen1820	14 55 0	148 44 30	H.M.S. *Talbot*.	624
XII.—SOCIETY ISLANDS.					
Maitea, or Osnaburgh Island	Wallis, 1767.	17 53 0	148 5 0	Cook.	632
Tahiti: Point Venus Lt.-house	Quiros, 1606.	17 29 11	149 28 55	Beechey, &c.	633
,, Papiete Harb., Motu-uta		17 31 35	149 33 58	French Officers.	637
,, Tataa or N.W. pt.		17 34 0	149 36 30	,,	638
,, S.W. point, Maraa		17 44 0	149 34 0	,,	639
,, South point		17 46 15	149 26 55	,,	639
,, Tiarrabu, South point		17 52 25	149 9 0	,,	640
,, ,, N.E. point		17 44 10	149 8 50	,,	640
,, Vairi (Isthmus)		17 43 10	149 17 30	,,	640
Tetuaroa Island		17 2 0	149 35 0	,,	642
Moorea, or Eimeo Island, Cook Bay, Nuupure or W. point	Wallis, 1767.	17 28 42	149 49 15	,,	644
Tapamanoa, Mauiti, or Sir Chas. Saunders' Island, N.E. pt.	,,	17 38 41	150 33 0	,,	644
Huaheine Id., Owharre Harb.	Cook, 1769.	16 43 0	151 7 0	Cook,	644
Raiatea, or Ulietea, Uturoa Harb.	Wallis, 1767.	16 50 0	151 24 0	Bethune.	645
Tahaa, or Otaha, centre	Cook, 1769.	16 35 0	151 35 0	Cook, &c.	646
Bola-Bola, or Bora-Bora, Otea-vanua Harbour	,,	16 31 35	151 46 0	,,	646
Marua, Maupite, or Manite	,,	16 26 0	152 12 0	,,	647
Tubai, or Motu-iti	,,	16 11 0	151 48 0	,,	647
XIII.—ISLANDS BETWEEN LATITUDES 10° & 20° S.					
Flint Island	..... 1801.	11 25 43	151 48 0	Wilkes.	648
Vostock Island (Anne or Stavers' Island)	Bellingshausen1820	10 5 0	152 23 0	Bellingshausen.	648
Mopelia, or Mopiha Island	Wallis, 1767.	16 50 0	154 0 0	Charts.	649
Bellingshausen Island	Kotzebue, 1824.	15 48 0	154 30 0	Kotzebue.	609

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Scilly Islands	Wallis, 1767.	16 28 0	154 50 0	Charts.	649
Reirson or Grand Duke Alexander Island, church	Bellingshausen1820	10 2 0	161 5 30	Richards.	649
Humphrey Island, N. point	Patrickson, 1822.	10 20 30	161 1 12	,,	650
Souworoff Islands	Lazareff, 1814.	13 13 15	163 5 0	Lazareff, &c.	650
Danger Islands	Byron.	10 54 0	165 53 0	Bellingshausen.	651
Tema Reef		11 5 30	165 37 0	Charts.	652
Nassau Island	Sampson, 1835.	11 31 50	165 23 56	Williams.	652
Gente Hermosa, or Swain's Id.	Quiros, 1606.	11 5 0	170 55 15	Wilkes.	652
Samoa, or Navigators Islands.					
Rose Id. (Kordiukoff or Middleton Id.)	Freycinet.	14 32 0	168 9 0	Sir E. Belcher.	655
Manua (Opoun) Island, Feleasau village, N.W. side		14 13 30	169 32 0	U.S. Ex. Ex., &c.	656
Olosinga, Orosenga, or Orisega Island, S.E. point		14 12 15	169 35 30	Haines.	657
Ofu (or Fanfoué) Island, islet off W. point		14 11 30	169 39 40	U.S. Ex. Ex., &c.	657
Tutuila (or Maouna) I., Anuu I.		14 18 40	170 34 0	,,	659
Pago-Pago Harbour, Ob. St., North side		14 16 10	170 40 35	Bethune.	658
West Cape		14 20 45	170 51 35	U.S. Ex. Ex., &c.	661
Fungasar Harbour, East pt.		14 18 0	170 45 50	,,	—
Cock's Comb Point		14 15 24	170 41 40	,,	—
Oafonu Harbour, anchorage		14 16 48	170 40 50	,,	—
Upolu Id., Nuulua Islet, E. pt.		14 2 20	171 22 10	,,	662
Falealili Harbour, town		13 59 0	171 39 15	,,	667
Safatu Harbour, E. village pt.		13 56 35	171 47 40	,,	667
Manono, or Platte Id., centre		13 50 10	172 4 15	,,	666
Apia Harbour, store		13 49 44	171 44 0	Richards.	664
Saluafata Harbour, anchorage		13 52 0	171 35 45	German Survey.	663
Apolima Island		13 48 30	172 6 0	U.S. Ex. Ex., &c.	666
Savaii Island, S.E. point		13 48 15	172 11 30	,,	667
Paluale, village		13 45 0	172 17 20	,,	668
S.W. point		13 48 40	172 35 0	,,	668
Mataatu, North point		13 28 0	172 21 15	,,	668
Nieue, or Savage Id., N.W. pt.	Cook, 1774.	19 0 0	169 50 40	Erskine.	669
Boscawen Island	Le Maire, 1616.	15 52 0	173 50 0	Layard.	670
Keppel Island	,,	15 58 0	173 52 0	,,	670
Curaçoa Reef	H.M.S. *Curacoa* 1865	15 31 0	173 44 0		671
Ten-fathoms Bank	,,	15 40 0	173 40 0		671
Niua-fu, or Hope Island	Edwards, 1791.	15 34 0	175 40 40	Hope, 1867.	671
Zephyr Reef	Wilson, 1876.	15 58 0	177 10 0	Wilson.	671
L'Enfant Perdu Island	Bougainville, 1768.	14 20 0	176 40 0	Bougainville.	675
Home or Lalla Rookh Bank	Home, 1824.	12 53 8	175 31 0	Sir E. Home.	672
Uvea, Uea, or Wallis Island: Allièr Bay, Fenua-fu Island	Wallis, 1767.	13 23 35	176 11 47		672
Hoorne Islands, Futuna Island, Mount Schouten	Le Maire, 1616.	14 14 20	178 7 0	Du Bouzet.	675
Alofa Id., Mt. Bougainvillle	,,	14 19 0	178 0 0	Charts.	675
XIV.—FIJI ISLANDS.					
Vatoa, or Turtle Island	Cook, 1773.	19 49 11	178 12 46	Surveys by Captain	682
Ongea Ndriki, S.W. peak		19 12 29	178 25 17	D'Urville, 1827;	683
Fulanga, S.W. bluff		19 9 30	178 36 0	the U.S. Ex. Ex.,	683
Kambara (or Apallo), S. point		18 59 35	178 57 0	1840; Capt. Den-	684
Tavunasithi or Tubanaielli, cen.		18 43 30	179 5 10	ham, R.N., 1857;	684
Yangasa, Ang-Hasa, or Table I.	Wilson.	18 56 30	178 26 15	and Lieutenants	684
Namuka (or Neat's Tongue), cen.	,,	18 50 45	178 37 30	Moore & Dawson,	685
Mothe or Mozé, centre		18 39 0	178 30 0	1876—1881.	685
Oneata, Observatory Island		18 25 46	178 26 8	,,	686

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Lakemba or Laguemba, S. pt.		18 15 15	178 47 30	Surveys by Captain	687
Argo Reef or Bukatatanoa, S.E. extreme		18 21 0	178 13 10	D'Urville, 1827; the U.S. Ex. Ex.,	687
Naiau, Neaou, or Oedida, centre		17 58 30	179 2 30	1840; Captain	688
Tuvutha, N.W. peak		17 39 33	178 49 31	Denham, R.N.,	688
Thithia, S.E. point		17 46 0	179 17 0	1857; and Lieuts.	688
Mango or Cox Island, pier		17 25 26	179 9 37	Moore & Dawson,	689
Vanua Mbalavu, N.W. point	Wilson.	17 9 30	179 1 30	1876—1881.	690
Kanathea, S.F. point	,,	17 16 15	179 7 20	,,	692
Vatu Vara Island, summit		17 25 30	179 31 30	,,	693
Naitamba, centre	Wilson.	17 1 0	179 16 30	,,	693
Wailangilala or Yalangatala, W. point	,,	16 44 50	179 5 56	,,	694
Nuku-Mbasanga Island		16 18 0	179 14 30	,,	695
Thikombia, N. hummock	Wilson.	15 43 0	179 57 30	,,	696
Taviuni, N.E. point		16 41 10	179 52 0	,,	699
Somo-Somo, town		16 46 0	179 57 45	,,	698
Ngamia, or Quamea Id., sum.		16 46 0	179 45 30	,,	700
Vanua Levu Island:—					
Undu or N.E. Pt. (Edw. Id.)	Wilson.	16 7 30	179 56 46	,,	702
Rambe or Gillet I., N.E. pt.	,,	16 26 20	179 54 30 East.	,,	702
Kumbalau Point, extreme		16 28 0	179 56 0	,,	704
Savu-Savu Bay, East point		16 48 45	179 18 0	,,	703
Mbua or Sandalwood Bay, Dimba-Dimba Point		16 49 30	178 31 0	,,	707
Yadua Id., Porpoise Hr., S. end of islet		16 50 25	178 18 0	,,	709
Naloa Bay, Tavea Island		16 37 0	178 43 30	,,	708
Muthuata Island		16 24 30	179 2 30	,,	709
Kia Island		16 13 0	179 4 30	,,	709
Mali Island, S.W. point		16 20 45	179 18 30	,,	710
Koro or Goro Island, N.W. pt.		17 15 24	179 21 40	,,	711
Horse-shoe Reef (Thaku-Momo)		17 39 0	179 17 35	,,	714
Nairai or Nirie Id., Needle Peak		17 48 33	179 25 30	,,	715
Goa or Ngau, N.W. point		17 57 30	179 15 15	,,	716
Mumbolithe Reef, centre	D'Urville.	18 13 25	179 19 0	,,	716
Mbatiki Island, summit		17 46 40	179 9 35	,,	716
Moala or Mouala, N.E. point	Bligh or D'Urville.	18 33 30	179 58 0	,,	716
Tova Reef, 2 ft., centre		18 39 31	180 28 0	,,	717
Totoya or Totoua Id., S.W. pt.	D'Urville.	19 0 25	180 8 0	,,	717
Matuku, S. end of bay on W. side	,,	19 10 15	179 45 45	,,	718
Viti Levu Id., Mbau or Bau Id.		17 58 20	178 37 45	,,	719
Rewa Harbour, Nukulau Id.		18 10 25	178 31 30	,,	722
Suva Harbour, entrance		18 8 30	178 23 16	,,	723
Namuka Island, summit		18 8 55	178 20 40	,,	725
Mbengha Island, W. summit		18 23 0	178 8 0	,,	726
Vatu-Lele Id., N. point		18 29 30	177 38 0	,,	727
Malolo Passage, Waldron Id.		17 50 40	177 11 30	,,	731
Malolo Id., N.E. point		17 44 0	177 11 20	,,	733
Underwood Group, Henry Id.		17 40 25	177 18 50	,,	733
Ba (town of)		17 27 0	177 38 30	,,	734
Ovalau, *Levuka, School-house*		17 40 45	178 49 0	,,	737
Yasawa Group, Vomo Island		17 30 0	177 16 30	,,	740
Waialailaithake, Obser. Peak		17 22 0	177 8 30	,,	741
Naviti Island, N.E. point		17 2 30	177 19 0	,,	741
Yasawa Island, S. point		16 51 15	177 27 0	,,	742
Asaua Island		16 44 0	177 31 15	,,	742
Awakalou or Round Island		16 40 0	177 46 15	,,	742
Viwa or Biva Id., N.W. point		17 8 15	176 53 0	,,	742
Kandavu, Cape Washington		19 6 45	177 57 30	,,	743
,, Tavuki Bay		19 3 9	178 6 23	,,	744
North Astrolabe Reef, N. point		18 36 0	178 32 0	,,	745

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XV.—NEW HEBRIDES, &c.			East.		
Aneiteum, Annatom, Pt. Inyang		20 15 17	169 44 0	Charts.	750
Erronan (or Fotuna), N.W. pt.		19 31 20	170 10 0	D'Urville.	751
Tanna Island, Point Resolution		19 31 17	169 29 0	Sir E. Belcher.	753
Immer or Aniwa Island, centre		19 17 0	169 37 0	Charts.	753
Erromanga Id., Traitor's Head		18 44 0	169 15 0	,,	755
Vate or Sandwich Id., S.E. pt.	Cook, 1774.	17 40 0	168 29 30	,,	755
Havannah Harb., Missionary Point		17 33 45	168 14 15	,,	757
Mai, or Three Hills Id., S.W. pt.	,,	17 6 0	168 17 45	,,	758
Two Hills Id., Monument Rock	,,	17 18 0	168 25 45	,,	758
Api or Tasiko Id., Namuka Islet	,,	16 49 30	168 19 0	,,	759
Ambrym Island, S.E. point		16 17 0	168 17 0	,,	761
Mallicollo Id., Port Sandwich		16 25 0	167 46 0	Cook and Erskine.	762
Maskelyne Islands, S. point	Cook.	16 34 30	167 50 0	Charts.	763
Pentecote or Whitsun Id., S. pt.	Bougainville.	16 59 0	168 10 0	Tilley.	764
Aurora Island, Narovo-rovo	,,	15 11 0	168 4 0	,,	765
Lepers Island, N.E. point	,,	15 14 0	167 55 30	Charts.	765
Star Peak, or Pic de l'Etoile, su.	,,	14 28 40	167 59 0	,,	769
Espiritu Santo Id., Cape Cumberland	Quiros, 1606.	14 36 0	166 38 0	Cook, &c.	766
,, ,, Cape Lisburne		15 40 0	166 44 0	,,	766
,, ,, Cape Quiros		14 55 0	167 0 0	,,	767
Banks Ids., Great Id., N. sum.	Bligh, 1789.	13 44 0	167 26 15	D'Urville, &c.	771
Valua Island, summit		13 37 0	167 38 30	,,	773
St. Claire Island	D'Urville, 1838.	14 20 45	167 50 0	,,	770
Sugar Loaf Island, summit	,,	13 49 0	167 39 30	Tilley, 1864-6.	772
Ureparapara or Bligh Id. S.pt.		13 35 0	167 17 0	Charts.	774
Torres Islands, N. Id., N. point		13 4 0	166 30 0	,,	774
,, ,, S. Id., S. point		13 27 0	166 39 30	,,	776
SANTA CRUZ ISLANDS.					
Vanikoro Id., summit, 3031 ft.	Edwards, 1791.	11 36 30	166 51 30	D'Urville.	776
,, Ocili Harbour		11 40 24	166 55 0	,,	777
Nitendi or Sta. Cruz I., C. Byron	Mendana.	10 40 0	166 0 30	Tilley, 1869.	780
,, Cape Boscawen, S.W. pt.		10 51 15	165 43 15	,,	780
,, Guerta or Trevanion Id.		10 40 0	165 41 30	,,	780
Suckling Reef	Lt. Suckling, R.N.	10 40 45	165 44 50	,,	780
Tinakula or Volcano Island	Mendana.	10 23 30	165 47 30	,,	781
Duff's Group, Tuamaco Island-	,,	9 57 0	167 0 0	Wilson.	784
North Island		9 45 0	167 4 0	Suckling, 1873.	784
Bayonnaise Bank	Tromelin, 1828.	12 8 30	179 43 30	Tromelin.	785
Rotumah, Atangota Island	Edwards, 1791.	12 32 0	177 5 0	Duperrey, &c.	785
Eagleston Reef	Eagleston.	12 30 0	178 0 0	Eagleston.	787
			West.		
Isabella Shoal	Pearson, 1832.	12 25 0	177 15 0	Pearson.	785
Adolph Bank		11 55 0	178 0 0		785
			East.		
Hamond Reef		15 32 0	175 20 0	Hamond.	787
Louisa Bank	1859.	11 45 0	175 52 0		787
Onaseuse, or Hunter Island (?)	Hunter, 1823.	15 31 0	176 11 0	Hunter.	787
Carter Reef		15 42 0	176 28 0		787
Balmoral Reef		15 40 0	175 58 0	*The Balmoral.*	787
A Reef		18 10 0	175 10 0		
Hazel Holm Bank, 1880.		12 44 0	174 4 0	*The Hazel Holm.*	787
Charlotte Bank, 1788.		11 15 0	173 12 0	Krusenstern.	788
Pandora Reef	Edwards, 1791.	12 11 0	172 7 0	Edwards.	788
Fataka, or Mitre Island	,,	11 56 0	170 20 0	Kroutcheff.	788
Anouda, Annula, or Cherry Id.	,,	11 37 0	169 40 30	Edwards.	788
Tucopia or Barwell Island	Quiros, 1606.	12 21 10	168 43 30	Tromelin.	788

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XVI.—GALAPAGOS ISLANDS.					
		South.			
Albemarle Island, Tagus Cove		0 15 55	91 26 45	The Survey by	794
,, ,, Iguana Cove		0 59 0	91 32 15	Capt. R. FitzRoy,	—
,, ,, C. Woodford		0 46 0	90 52 0	in H.M.S. *Beagle*.	—
,, ,, C. Marshall-		0 3 0	91 17 15	,,	—
		North.			
,, ,, Pt. Albemarle		0 10 0	91 26 45	,,	794
Redondo Rock, 85 ft. -		0 13 30	91 40 15	,,	794
		South.			
Narborough Id., Cape Douglas		0 20 0	91 44 0	,,	794
,, ,, Cape Hammond		0 30 30	91 40 10	,,	—
		North.			
Culpepper Island, summit -		1 39 30	92 4 30	,,	795
Wenman Island, N.W. summit		1 22 55	91 53 30	,,	795
Abingdon Island, summit -		0 34 25	90 48 25	,,	795
Bindloe Island, S. summit -		0 18 50	90 33 55	,,	795
Tower Island, W. cliff -		0 20 0	90 2 30	,,	795
		South.			
James Id., Sugar-loaf, 1,200 ft.		0 15 20	90 56 15	,,	795
,, James Bay, beach -		0 12 5	90 55 25	,,	796
,, Sulivan Bay, point		0 17 5	90 39 5	,,	796
Jervis Island, summit - -		0 25 0	90 47 30	,,	796
Duncan Island, centre hill -		0 36 30	90 45 25	,,	796
Indefatigable Island, Eden Id.		0 33 10	90 37 30	,,	796
Barrington Island, W. summit		0 50 30	90 10 0	,,	796
Charles Island, Post-office Bay		1 15 25	90 31 30	,,	797
,, ,, summit -		1 19 0	90 32 0	,,	797
Hood Island, East summit -		1 25 0	89 44 0	,,	797
,, Gardner Bay, head		1 22 10	89 44 0	,,	798
MacGowan Shoal, centre -		1 8 30	89 59 30	,,	798
Chatham Island, Mount Pitt -		0 44 15	89 21 0	,,	798
,, Terrapin Road -		0 43 30	89 27 0	,,	799
,, Stephen's Bay, W. pt.		0 50 0	89 37 0	,,	798
,, Freshwater Bay -		0 56 25	89 33 25	,,	798
XVII.—MARQUESAS ISLANDS, &c.					
Fatou Hiva, Bon Repos B., ldg.	Mendana, 1595.	10 31 5	138 41 0	Surveys by M. de	805
Motane or San Pedro, S.S.E. pt.		10 0 40	138 48 30	Tessan under Capt.	806
Taouata, Resolution Bay -		9 56 0	139 6 30	Du Petit Thouars,	807
O-Hiva-oa, Cape Balguerie -		9 43 30	138 47 30	1838; Lieut. Jouan,	808
Fatou-houkou or Hood Id., cen.-		9 26 30	138 55 10	1855, 1856; Captain	810
Oua-pou or Roapoua Id., N. pt.		9 20 40	140 5 0	Pierre, 1875; &c.	810
,, Vaieo Bay, Obelisk Island		9 23 30	140 6 45	,,	811
Oua-Houka, Motu Haane -		8 56 0	139 31 58	,,	811
Nouka Hiva, Cape Martin -		8 56 15	140 0 10	,,	813
,, Comptroller B., P. Haka		8 54 0	140 2 20	,,	813
,, Tai-o-hae, or P. A. Maria		8 55 16	140 6 0	,,	814
,, Tschitschagoff, Port -		8 56 40	140 8 40	,,	816
,, West Point - -		8 52 30	140 13 45	,,	817
,, Summit, 3,840 ft. -		8 54 0	140 9 45	,,	818
Motu-iti or Hergest Islet, 130 ft.		8 41 30	140 36 30	,,	818
Low Island - - -		7 53 0	140 22 30	,,	818
Hiaou or E-Iao Id., S. point -		8 3 30	140 39 40	,,	818
Hatoutou or Chanal I., N.E. pt.		7 58 45	140 37 15	,,	819

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DETACHED ISLANDS BETWEEN THE EQUATOR AND 10° S.		° ′ ″	° ′ ″		
		South.	West.		
Caroline or Thornton Island -	Broughton, 1795.	9 54 0	150 8 0	Broughton, Nares.	820
Malden Id. Anchorage, W. side-	Byron, 1825.	4 5 0	154 56 0	Thomas, 1867.	821
Starbuck Island (Volunteer Id.)	,,	5 36 30	155 51 0	,,	821
Tongarewa or Penrhyn Island-	*The Penrhyn*, 1788.	8 55 15	158 7 0	Wilkes.	822
Jarvis Island - - -		0 22 33	159 54 11	,,	823
TOKOLAU or UNION GROUP :—					
Fakaafo or Bowditch Id., N.pt.	U.S. Ex. Ex., 1840.	9 20 0	171 4 0	,,	824
Nukunono, or D. of Clarence I.	Edwards, 1791.	9 5 0	171 38 0	,,	825
Oatafu, or Duke of York Id.-	Byron, 1765.	8 36 0	172 24 0	,,	825
PHŒNIX GROUP :—					
Mary Island - - -		2 44 35	171 42 0	Meade.	826
Enderbury Island - -		3 8 42	171 3 32	Hemphill.	826
Phœnix Island - -		3 47 0	170 43 0	Williams, &c.	827
Birney Island - -	Emment.	3 37 0	171 42 0	Wilkes, &c.	828
Gardner Island, S.W. point -		4 37 42	174 40 18	,,	828
McKean Island - -	U.S. Ex. Ex.	3 35 10	174 17 26	,,	828
Hull Island, N.W. point -	U.S. Ex. Ex.	4 29 48	172 20 52	,,	828
Sydney Island - -		4 25 0	171 20 0	Williams, &c.	828
		North.			
Baker Island, centre - -		0 13 30	176 29 30	Meade.	828
Howland Island, centre -		0 49 0	176 40 0	,,	829
ELLICE GROUP :—		South.	East.		
Independence or Sophia Id. -	American discovery	10 46 0	179 31 0	Challis, 1870.	829
Meek Shoal - - -	Sir J. Meek, 1832.	10 40 0	179 8 0	Meek.	829
Rose Bank - - -		11 3 0	179 50 0	*The Rose.*	830
Nukulaelae or Mitchell Group	Boissier.	9 27 0	179 54 0	Boissier.	830
Funafuti, or Ellice I., E. pt.-	Peyster, 1819.	8 31 20	179 21 15	Wilkes.	830
Peyster Group, N. extremity-	,,	7 56 11	178 28 50	,,	832
Vaitupu, or Tracy I., S. pt. -	Reynolds.	7 30 0	178 46 0	,,	832
Niutao, Lynx, or Speiden Id.		6 10 0	177 21 0	H.M.S. *Basilisk* 1872	833
Nui, Netherlands, or Eeg Id.-	1825.	6 8 0	177 22 0	,,	833
Gran Cocal Shoal - -	Maurelle, 1781.	6 5 0	176 13 0	Duperrey.	834
Nanomaga or Hudson Island	*The Elizabeth*, 1809.	6 19 0	176 23 15	Wilkes.	834
Nanomea, or St. Augustine I.	Maurelle, 1781.	5 39 10	176 6 0	Duperrey.	834
Jesus Island (?) - -	Mendana, 1567.	6 45 0	171 30 0		835
Nameless Island (?) - -		2 50 0	170 18 0		835
Paanopa or Ocean Island -	*The Ocean*, 1804.	0 52 2	168 24 25	Dutaillis.	836
Mattoetee or Kennedy Island -	*The Nautilus*, 1801.	8 36 0	167 50 0		837
Pleasant or Shank's Island -	Fearn, 1795.	0 25 0	167 5 0	Cheyne.	836
XVIII.—SOLOMON IDS., NEW GUINEA, &c.					
SOLOMON ISLES.					
Y-Oriki, or Santa Catalina Id.-	Mendana, 1567.	10 53 30	162 25 30	Charts.	841
Ou-ah or Santa Anna Island -		10 49 0	162 31 0	D'Urville.	841
San Christoval Id., Cape Phillip		10 31 23	161 26 35	Denham.	844
Makira or Leoué Bay -		10 25 23	161 26 9	,,	844
Cape Recherche - -		10 10 0	161 19 30	Charts.	842
Cape Keibeck - -		10 28 0	162 2 0	Tilley, &c.	842
Ugi Id., Selwyn Bay, hut -		10 15 10	161 41 55	Hughes.	852
Contrariétés Island, S. point -		9 50 30	161 58 0	D'Urville, &c.	844
Malayta Island, Cape Zélée -		9 45 0	161 30 24	,,	845
Mount Kolowrat - -		9 6 30	160 57 30	,,	845
Bauna or Bau - -		9 10 0	160 51 0	Tilley, 1873.	847
Alite Harbour, anchorage -		8 59 0	160 45 0	Messum.	847
Bejean Reef - - -		8 56 0	160 38 0	Tilley, 1873.	847
Cape Ritters - - -		8 44 0	160 37 0	D'Urville, &c.	847
Cape Astrolabe - -		8 22 0	160 29 0	Tilley, 1873.	847

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Guadalcanar Id., Marau Sound,					
Ferguson Island - -		9 50 30	160 48 45	Bower.	849
Cape Henslow - -		9 58 42	160 34 53	Denham.	851
Cape Hunter - -		9 49 13	159 47 17	,,	851
Wanderer Bay, Boyd Creek -		9 41 47	159 39 34	,,	851
Cape Espérance - -		9 13 30	159 41 0	Charts.	851
Rua Sura Islands, anchorage		9 29 30	160 35 30	Oldham.	843
Florida Id., Barranago Island,					
Thumb Rock - -		9 10 0	160 10 20	Bower.	854
Buena Vista Island - -		8 53 30	159 59 30	D'Urville, &c.	855
Inattendue or Gower Island -	Surville, 1767.	7 56 0	160 11 0	Hogan.	855
Ysabel Island, Cape Prieto -		8 34 0	159 46 0	D'Urville, &c.	856
Astrolabe Harbour - -		8 31 0	159 33 0	,,	857
Cape Comfort - -		7 23 40	158 5 0	,,	858
Port Praslin - - -		7 25 0	158 20 0	,,	858
Lass Shoal - - -	Lass, 1861.	7 45 0	159 54 0	Lass.	858
Buraquoi or Murray Island -		9 2 0	158 34 0	Tilley.	858
New Georgia, Cape Pitt -		8 53 0	158 14 30	Surville.	859
Cape Nepean - -		8 46 0	157 36 30	Charts.	—
Cape Deception - -		8 42 0	157 30 0	D'Entrecasteaux.	—
Rendova Bay - -		8 23 23	157 15 25	H.M.S *Blanche* 1872	861
Simbo or Eddystone Rk., Obs. S.		8 18 0	156 30 40	D'Entrecasteaux.	864
Kezo or Shark Island, E. end -		8 5 40	156 50 0	Rendell.	863
Choiseul Island, Cape Labée -		7 28 0	157 53 0	Charts.	865
Cape Alexander - -		6 37 0	156 27 0	,,	866
Choiseul Bay - -		6 48 0	156 21 0	,,	866
Treasury Id., centre - -		7 20 0	155 26 0	Von Schleinitz.	867
Shortland Id., Cape Stephens -		7 8 0	155 42 30	Charts.	867
Bougainville Id., C. Friendship		6 44 0	155 47 0	Bougainville, &c.	867
Cape l'Averdi - -		5 30 0	155 7 14	D'Urville.	869
Gazelle Harb., Hüsken Point -		6 35 0	155 5 0	Von Schleinitz.	868
Bouka Island, summit - -		5 16 0	154 39 0	,,	869
Cape North - - -		5 0 30	154 40 10	,,	869
Stewart Islands, Hogan's Id. -		8 24 24	163 2 0	1847.	870
Roncador Reef, Candelaria Banks (?) - - -	Mendana, 1567. Maurelle, 1781.	6 17 0	159 14 0	Krusenstern.	870
Bradley Reef (?) - -	Hunter, 1791.	6 52 0	161 6 0	Hunter.	871
Ontong Java Island, or Howe's Group (?) West end -	Le Maire, 1616. Hunter, 1791.	5 24 0	159 10 0	Johnson, 1862.	871
Mortlock or Massacre Isles -	Mortlock, 1795.	4 45 0	157 0 0	Mortlock.	872
Le Maire and Tasman's Isles -	Tasman, 1643.	4 29 0	159 28 0	Wellings.	872
Frindsbury Reef - -	1832.	5 0 0	159 9 0	Raper.	872
Simpson's Islands - -	Simpson.	4 52 0	160 12 0	Simpson.	872
Marqueen Island - -	Le Maire, 1616.	4 36 0	156 30 0	Wilkinson.	872
Cocos Islands - - -	Wilkinson, 1790.				
Carteret or Nine Ids., Green Id.	Carteret, 1767.	4 48 0	155 8 0	*The Carola*, 1883.	873
Groene or Hardy Ids., S. Id., S. point - - -	Le Maire, 1616. Carteret, 1767.	4 38 0	154 10 0	Fradin, 1861.	873
Rennell Island, S.E. extremity -	Wilkinson, 1790.	11 52 0	160 40 0	Richards.	874
Indispensable Reefs, N.W. end -	,,	12 15 0	159 59 45	,,	874
Schofield or Neptune Reef (?) -	Schofield, 1868.	12 54 0	161 45 0	Schofield.	875
Well's Reef, East end (?) -	Edwards, 1791.	12 20 0	157 58 0	Edwards.	875
Pocklington Bank, E. extreme -	Pocklington, 1825.	10 45 25	155 51 40	H.M.S. *Lark*.	875
New Britain :—					
Cape Stephens - -		4 8 0	152 8 0	Powell, &c.	876
Cape Palliser - -		4 36 0	152 20 30	,,	877
Cape Orford - - -		5 21 0	152 10 0	D'Urville, &c.	878
Quoy Peak - - -		5 30 0	151 44 0	,,	878
Port Montagu - -		6 10 0	150 40 0	,,	878
Cape South - - -		6 30 0	149 48 0	,,	878
Cape Anne - - -		5 40 0	148 17 2	,,	879
Cape Gloucester - -		5 28 0	148 23 0	,,	879
Cape Lambert - -		4 9 30	151 37 0	Powell, &c.	882
Mérite Island - - -		4 54 0	149 5 0	,,	880
Gipps Island - - -	King, 1842.	4 15 0	149 16 30	King.	880

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Willaumez Island, South point		5 15 3	149 58 10	D'Entrecasteaux.	881
Squally or Kerué Island	Tasman (?).	1 40 0	150 30 0	Charts.	888
St. Matthias Island, centre	,,	1 40 0	149 40 0	,,	887
New Ireland :—					
Cape St. George		4 51 0	152 48 14	Duperrey.	885
Cape Santa Maria		4 2 0	153 10 0	Charts.	885
Cape Byron, or North Cape		2 32 30	150 47 30	,,	888
Sandwich Island, peak		2 55 0	150 49 0	D'Entrecast., &c.	890
Duke of York Id.; Pt. Hunter		4 5 30	152 28 0	Charts.	893
Carteret Harbour		4 43 0	152 43 0	,,	894
Gower Harb., or Port Praslin		4 49 15	152 48 0	,,	894
St. John Id., N.E. point	Tasman.	4 2 0	153 46 0	Fradin.	885
Anthony Kaan Island	,,	3 30 0	153 30 0	Bougainville.	886
Faed or Abgarris Id., N. pt.	Renneck, 1826.	3 9 0	154 22 0	Renneck.	886
Goodman Island, shoal South of		3 33 0	154 37 0	,,	886
Gerrit Denys Island	Tasman.	3 4 0	152 34 0	Bougainville.	886
Lyra Shoal	Renneck, 1826.	1 53 0	153 28 0	Renneck.	886
Vischers or Fisher's Id., centre	Le Maire, 1616.	2 40 0	151 58 0	Charts.	887
New Hanover, Q. Charlotte's Fd.		2 28 0	149 55 0	,,	889
Portland Islands, N.E. pt. of reef		2 31 45	149 46 0	,,	889
Admiralty Ids., Sugar-loaf Id.		2 22 30	146 49 15	D'Entrecasteaux,	897
,, Western Isles		2 12 0	146 0 40	Cheyne, &c., 1862.	898
,, Nares Harb., Obs. Id.		1 55 10	146 40 56	Tizard.	899
,, Jesus Maria Island, W. point		2 21 0	147 42 0	D'Entrecasteaux.	900
,, La Vandola		2 13 30	148 12 30	,,	901
,, Elizabeth Id., N. end		2 54 45	146 49 0	,,	902
Purdy Isles; Mole Island	Bristow, 1817.	2 51 0	146 15 0	Bristow.	903
Sherburne Shoal, S.E. point	White, 1824.	3 15 0	148 16 0	White.	903
Circular Reef	Renneck, 1825.	3 18 0	147 40 0	Renneck.	903
Sydney Shoal	Forrest, 1806.	3 20 0	146 50 0	Forrest.	903
Albert Reef	..... 1842.	3 58 0	147 58 0	Charts.	903
Victoria Reef	..... 1842.	4 17 0	148 10 0	,,	903
Anachorètes Island	Bougainville, 1768.	0 50 0	145 30 0	Bougainville.	904
Commerson Island	,,	0 40 0	145 17 0	Charts.	904
Los Monjos Island	Maurelle, 1781.	0 57 0	145 41 0	Maurelle.	904
Boudeuse Island	Bougainville, 1768.	1 26 0	144 34 0	Bougainville.	904
L'Echiquier Island, South point	,,	1 40 30	144 3 0	D'Entrecasteaux.	904
Hermit Islands, Alacrity Har., Pémé Island	Maurelle, 1781.	1 28 50	145 5 45	Sanders, 1874.	905
Matty Island	Carteret, 1767.	1 46 0	142 56 0	D'Entrecasteaux.	905
Durour Island	,,	1 33 40	143 12 30	,,	905
Tiger Island	Bristow, 1817.	1 45 0	142 2 0	Bristow.	905
XIX.—NEW GUINEA, THE LOUISIADE ARCHIPELAGO, AND TORRES STRAITS.					
Fly River, Tree Islet		8 41 0	143 37 0	Macfarlane, 1875.	908
Aird Hill		7 30 0	144 22 0	Charts.	909
Yule Island, centre		8 50 30	146 32 0	Moresby, 1873-4.	909
Redscar Head		9 17 0	146 54 0	,,	911
Port Moresby, Basilisk Pass		9 31 0	147 8 30	,,	912
Mount Owen Stanley, 13,205 ft.		8 53 0	147 32 0	,,	913
South Cape		10 43 30	150 14 0	,,	917
Hayter Island, West end		10 37 0	150 41 30	,,	919
Discovery Bay		10 24 0	150 26 0	,,	921
East Cape, village		10 12 30	150 52 50	,,	921
Basilisk Island, Negro Head		10 31 35	150 52 15	,,	922
Moresby Island, South point		10 40 15	151 2 20	,,	922
Cape Frere		10 4 50	150 12 0	,,	926
Cape Nelson		9 0 0	149 16 0	,,	927

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Cretin Isles		6 43 0	147 53 30	Moresby, 1873-4.	929
Cape King William, village		6 1 0	147 38 0	,,	929
Astrolabe B., Port Constantine		5 29 53	145 46 8	Chart.	930
Humboldt Bay, Challenger Cove, Observation Islet		2 36 0	140 42 11	H.M.S. *Challenger*.	932
Point D'Urville		1 24 0	137 47 0	Jacquinot.	933
Louisiade Arch., Adèle Island	Ruault-Coutance.	11 29 50	154 26 10	Stokes.	934
St. Aignan Island, E. point		10 43 0	152 49 0	Charts.	936
D'Entrecasteaux Islands—					
Cape Ventenat		10 11 0	151 14 0	Moresby, 1873-4.	937
Cape Mourilyan		9 38 0	150 30 0	,,	938
Goulvain Island		9 45 0	150 56 0	,,	938
Laughlan Islands, East point	Laughlan, 1812.	9 19 3	153 48 30	D'Urville.	939
Cannac Island	D'Urville, 1827.	9 19 0	153 30 0	,,	939
Woodlark Island, East end	Grimes, 1836.	9 9 0	153 5 0	Hunter.	939
Guasap, South side		9 10 0	152 55 0	,,	940
Marshall Bennett Ids., E. one	Hunter, 1836.	8 50 0	152 0 0	,,	940
Evans Island	,, 1841.	9 10 0	151 55 0	Dutaillis.	940
China Strait, Teste Island		10 56 0	151 4 0	Moresby.	941
Goschen Strait, East Cape		10 12 30	150 52 50	,,	943
Torres Strait, Bramble Cay		9 7 50	143 52 10	Owen-Stanley.	946
Darnley Island, peak		9 35 20	143 45 0	,,	946
Raine Island, beacon		11 35 50	144 2 20	,,	970
Booby Island		10 36 5	141 54 45	,,	952
Thursday Island, Vivien Pt.		10 35 10	142 12 53	Charts.	952
XX.—THE CORAL SEA, AUSTRALIA, &c.					
Coral Sea.					
Cato Islet and Bank, centre	1803.	23 15 0	155 34 0	Denham.	956
Capel Bank, p. d.	*Hyacinth*, 1835.	25 18 0	159 20 0	,,	958
Wreck Reef, Bird Islet	Flinders, 1803.	22 10 30	155 29 21	,,	956
Kenn Reef, centre beacon	Kenn, 1824.	21 15 44	155 49 25	,,	957
Frederick Reef, South end	*Frederick*, 1812.	21 1 46	154 25 7	,,	957
Saumarez Reef, N.E. Cay	Lihou, 1823.	21 38 11	153 47 21	,,	957
Bellona, &c., Reefs, Herald Cay	*Bellona*, 1793.	21 47 20	159 35 1	,,	958
Observatory Cay	Lamb, 1812.	21 24 18	158 52 51	,,	959
West point, S. Bellona Reef		21 52 22	159 26 10	,,	958
Miller Reef (?), Basque	*H. Miller*, 1868.	20 51 0	158 2 0		959
Chesterfield Reefs, Loop Island	Lamb, 1793.	19 58 30	158 30 0	Denham.	960
Bampton Reef, North elbow		19 1 19	158 27 3	Charts.	960
Brown Reef (?)	Brown, 1867.	17 38 0	154 43 0	Brown.	961
Marion Reef	Paget, 1868.	19 10 0	152 14 0	Paget.	961
Mellish Reefs, Duroc Reef Bcn.	Bristow, 1812.	17 24 39	155 53 25	Denham.	961
Lihou Reefs, S.W. extreme	Brodie, &c.	17 38 0	151 26 0	,,	961
Observatory Cay, at N.E. end		17 7 20	152 6 20	,,	962
Diamond Islets, central islet	Dale, 1883.	17 26 0	151 0 0	Dale.	—
Herald Cays, North Cay	Denham.	16 56 0	149 12 56	Denham.	962
Herald's Surprise	,,	17 21 18	148 28 50	,,	962
Flinders' Reefs, South end		17 53 30	148 27 50	,,	962
Malay Reef	Love, 1875.	17 58 0	149 20 0	Love.	962
Holmes Reefs, S.W. extreme	Holmes, 1854.	16 30 0	147 47 41	Denham.	962
Coringa, or Willis Islets, E. one	*Coringa*, 1845.	16 53 0	149 55 0	Dobson, 1849.	962
Madelaine Cays, South one	*Duroc*, 1856.	16 35 47	150 19 46	,,	963
Willis Islets, South one		16 16 48	150 1 0	,,	963
Heath Reef, 1883		15 28 0	147 6 0		—
Osprey Reef, N.E. extreme	..... 1844.	13 51 10	146 36 0	Dobson, 1849	963
Diana Bank (?), p. d.	Bougainville.	15 41 0	150 30 0	Flinders.	963
Eastern Fields, N.E. extreme	Flinders.	10 2 0	145 45 0	,,	963
Grimes Shoal	..... 1825.	23 53 0	161 10 0	Charts.	966
Hamond Island (?)		22 30 0	162 51 0	Hamond.	966
A Rock (doubtful)		24 0 0	160 15 0	Charts.	966
Tamar Reef	*Tamar*.	21 21 0	161 36 0	,,	966
Fairway Reef	..... 1791.	21 0 15	161 45 9	Denham.	966

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Nereus Shoal		20 5 0	160 30 0	Simpson.	966
Middleton Reef, West elbow		29 27 40	159 4 17	Denham.	966
Elizabeth Reef, centre	..... 1820.	29 56 0	159 4 50	Richards.	966
Lord Howe Id., Mount Gower	Ball, 1788.	31 36 30	159 5 10	Denham.	967
„ N.E. bay	„	31 31 38	159 5 58	„	968
Ball's Pyramid	„	31 45 10	159 16 10	„	968
Great Barrier Reefs.					
Yule entrance, South side		10 23 0	143 56 30	Blackwood.	970
Olinda entrance, centre		11 14 30	144 6 0		970
Pandora entrance, S.E. side		11 26 30	144 1 30	„	970
Raine Island, beacon		11 35 50	144 2 20	„	971
Blackwood Channel, entrance		11 41 0	143 55 0	„	972
Great Detached Reef, outer ext.		11 44 30	144 7 0	„	972
Wreck Bay, Black Rocks		12 12 30	143 56 0	„	972
Coast of Queensland.					
Cape Melville, N.E. extreme		14 10 0	144 33 30	Blackwood, Stanley	973
Lizard Island, summit		14 40 0	145 30 0	„	973
Cape Grafton, northern summit		16 52 35	145 57 20	Stanley.	974
FitzRoy Isle, summit		16 55 45	146 1 30	„	974
Rockingham Bay, Goold Isle, peak		18 9 30	146 12 0	Blackwood & Evans	974
Cape Cleveland, lighthouse		19 11 25	147 1 10	Evans.	975
Cape Bowling-green, lt.-house		19 19 20	147 27 40	„	976
Cape Upstart, Sandy Bay		19 42 49	147 46 44	Yule.	976
Port Denison, Observatory Pt., West side of Stone Isle		20 0 50	148 17 50	J. W. Smith.	977
Northumberland Isles, S.E. pk.		21 57 30	150 42 0		978
Mackay or Pioneer R., lt.-house		21 10 20	149 17 30		978
Port Bowen, Round Islet		22 31 15	150 50 0		979
FitzRoy River, lightvessel		23 32 5	150 57 5		981
Cape Capricorn, lighthouse		23 29 30	151 15 0		982
Capricorn Group, North Reef lighthouse		23 10 50	151 56 10		983
Bunker Group, No. 1 Island		23 54 20	152 24 30	Bedwell.	983
Lady Elliot Islet, lighthouse		24 7 0	152 45 30	Evans.	983
Bustard Head, lighthouse		24 1 20	151 42 0	Charts.	984
Port Curtis, Gatcombe lt.-house		23 53 4	151 23 45	Stanley and Yule.	986
Burnett River, lighthouse		24 45 0	152 25 0	Charts.	989
Sandy Cape, lighthouse		24 43 20	153 13 45	„	989
Breaksea Spit, North extreme		24 24 30	153 13 0	Evans.	990
Wide Bay, outer edge of the bar		25 47 0	153 13 50	Charts.	994
Cape Moreton, lighthouse		27 2 10	153 29 0	Wickham, &c.	995
Coast of New South Wales.					
Shoal Bay, Clarence R., lt.-ho.		29 25 30	153 23 10	Wickham, &c.	1002
South Solitary Island, lt.-house		30 11 50	153 17 15	Charts.	1002
Port Macquarie, entrance		31 25 30	152 54 15	Flinders, &c.	1003
Sugarloaf Point, lighthouse		32 26 10	152 33 20	Charts.	1004
Port Stephens, Stephens Point, lighthouse		32 45 10	152 13 20	Yule.	1004
Newcastle Harb., Nobby Head, lighthouse		32 55 15	151 49 15	Stokes, &c.	1006
Cape Three Points, second point		33 30 0	151 27 20	„	1009
Broken Bay, Baranjo Head		33 35 0	151 20 30	„	1009
PORT JACKSON:—					
Outer South Head, lighthouse		33 51 15	151 18 15	Raper.	1010
Fort Macquarie		33 51 42	151 14 0	„	1013
Garden Island		33 51 54	151 14 47		1013
Jerusalem Bank	Largie, 1876.	34 20 0	151 54 0	Largie.	1021
Cape Banks, extreme		34 0 0	151 15 55	Charts.	1021

	Discoverer.	Lat. South.	Long. East.	Authorities.	Page
		° ′ ″	° ′ ″		
Bellambi Bay, centre - -		34 22 0	150 57 0	Charts.	1022
Wollongong Head, summit -		34 25 30	150 56 10	,,	1023
Jervis Bay, Bowen Isle, N. pt.		35 6 45	150 47 30	,,	1024
Jervis Bay, lighthouse - -		35 9 15	150 47 22	,,	1024
Ulladulla, lighthouse - -		35 21 30	150 30 0	,,	1025
Bateman Bay, S.W. Tollgate Isle - - - -		35 45 30	150 16 30	,,	1025
Montagu Island, lighthouse -		36 15 20	150 14 30	,,	1026
Cape Dromedary, extreme -		36 18 40	150 9 0	,,	1026
Twofold Bay, Lookout Pt. lt.-ho.		37 4 30	149 55 30	,,	1026
Cape Howe, Gabo Id., light-ho.		37 34 20	149 55 45	,,	1027
Bass Strait:—					
Cliffy Island, lighthouse -		38 57 10	146 42 20	,,	1036
King Id., Cape Wickham ltho.		39 35 35	143 57 0	,,	1029
Kent Group, Deal Id., lightho.		39 29 45	147 19 0	,,	1028
Banks Str., Swan I. lightho.-		40 43 30	148 6 30	,,	1031
,, Goose I. lightho.		40 19 0	147 48 0	,,	1028
Tasmania:—					
Eddystone Pt. (lt. proposed)-		40 59 0	148 20 0	,,	1031
Port Dalrymple, Low Head lt.		41 3 25	146 48 15	,,	1032
Hobart, Fort Mulgrave -		42 53 32	147 21 13	FitzRoy, &c.	1035
Coast of Victoria.					
Port Albert, old lighthouse -		38 45 10	146 37 50	Charts.	1035
Cape Schanck, lighthouse -		38 29 42	144 53 10	,,	1036
Port Phillip, Pt. Lonsdale lt.-ho.		38 17 40	144 36 58	,,	1037
,, Schnapper Light -		38 12 50	145 2 10	,,	1044
,, Geelong, Custom Ho.		38 8 52	144 21 48	,,	1050
,, Melbourne Observ. -		37 49 53	144 58 42	Govt. Astronomer.	1046
Cape Otway, lighthouse -		38 51 45	143 31 10	Charts.	1056
Warrnambool, Upper light -		38 23 30	142 29 15	,,	1057
Port Fairy, Griffith Id. lightho.		38 23 35	142 15 30	,,	1059
Cape Nelson, lighthouse -		38 25 45	141 32 50	,,	1059
Portland Bay, Observatory Hill		38 21 40	141 37 15	,,	1060
Coast of South Australia.					
Cape Northumberland, lightho.		38 3 40	140 40 3	Charts.	1061
Cape Banks, Carpenter Rks. Pt. lighthouse - - -		37 54 15	140 23 10	,,	1062
Cape Jaffa, light - -		36 57 40	139 37 15	,,	1062
Kangaroo Id., Cape Willoughby lighthouse - - -		35 51 5	138 7 30	,,	1064
St. Vincent Gulf C. Jervis lt.-ho.		35 37 0	138 5 50	Flinders.	1065
,, Glenelg Jetty lt.-ho.		34 59 30	138 30 30	Charts.	1066
,, Port Adelaide, lt.-ho.		34 48 3	138 28 7	,,	1067

SECTION II.

CHAPTER I.

THE STRAIT OF MAGALHAENS.

1.—FROM THE EASTERN ENTRANCE TO CAPE FROWARD.

Fernañdo de Magalhaens (or Magalhanes), a Portuguese by birth, and a commander of reputation, offered his services, from some fancied slight, to the King of Spain, Charles V., who received his proposition favourably; this was to sail round the South extreme of America, if possible, and thus find a new route to the Molucca Islands. The expedition, consisting of five ships, left Seville (or rather San Lucar) Sept. 20, 1519, reached the American coast, and at last determined on wintering in Port San Julian; here a very serious mutiny broke out, but was quelled. They quitted the port on Oct. 18, 1520, and three days after found themselves off a cape whence a deep opening was perceived. This was on St. Ursula's day (Oct. 21), hence they called the cape De las Virgenes. The commander sent an expedition for five days to explore the opening, and then conjectured, from various evidences, that there was a passage through to the other sea. The expedition then entered the strait, and on Nov. 27, 1520 (37 days after the discovery of Cape Virgenes), they found themselves again in an open sea, and gave the name of Deseado (the Desired) to the cape, the West point of Tierra del Fuego.* The strait was soon after its discovery distinguished by a variety of names. It was called De la Vitoria, from that ship first discovering its eastern entrance; it was also called Streto Patagonica, from the

* Although Magalhaens did not live to complete the voyage, of which the discovery of the South extreme of the American continent and of the strait which now bears his name were the first and principal features, yet, from other circumstances, he must be considered as the first circumnavigator. After having proceeded northward from the West entrance of the strait, he bore away to the westward, probably passing near Tahiti, and was killed by the natives in an affray at the Island of Zebu, one of the Philippines, April 27, 1521.—*See* Herrera, dec. 3; Hakluyt, vol. iii.; Burney, vol. i., ch. 2; Peter Martyr, dec. 5, cap. 7, &c.

large-footed Indians (Patagonians) first seen by Magalhaens; and it was also called the Archipelago de Cabo Deseado; but it has very properly assumed that of its discoverer: but even this has been variously spelt. The Spaniards call him Magallanes; others of his countrymen write it Fernando de Magalhanes; in Italian it has been Magaglianes; and in English, Magellan. The true form of the name, which is still a common one in Portugal, is, as re-adopted by Capt. King, and here used, Magalhaens.

It need scarcely be said, that the northern side of the strait is formed by the continent of America, the country of the Patagonians, who, however, do not show themselves in very great numbers on its shores. Interesting descriptions of them will be found in Capt. FitzRoy's Narrative. The opposite side of the strait is Tierra del Fuego, "the Land of Fire," as it was named by Magalhaens, from his seeing many fires on its shores during the first night he approached it.

In 1881 it was announced that the Argentine Republic and Chile had come to an arrangement whereby the Andes line, stretching South across the Straits of Magalhaens to Mounts Sarmiento and Darwin, is to be the boundary between them. Cape Virgins is the Argentine limit in the Atlantic, whence a line is drawn to the Andes in lat. 52° S., long. 72° W. The coasts of the strait will thus belong to Chile, while Tierra del Fuego and the adjacent islands will be divided according to the Andes line.

In passing through the strait, a distance of 320 miles, an entire change in the features of the country, and probably in the weather, will be experienced in its various parts. From Cape Virgins to Cape Negro the land is low and covered with grass, but not a tree is visible. Throughout this portion, extending 130 miles, the depth of water rarely exceeds 30 or 40 fathoms. There are many banks and shoals, the tides are rapid, with a rise and fall ranging from 42 to 15 ft., and anchorage may be found almost anywhere except in the narrows.

At Cape Negro, mountainous and woody country commences, and continues, without even partial intermission, in all the western part of the strait, and also northward as far as Chiloe Island. In this part the shores are steep, the water deep, and but little tide exists; the only difficulty in the navigation being that of obtaining suitable anchorages, at convenient distances, for the large steam vessels which now pass through.

Inhabitants.—Of the natives of this inclement region a few words may be said. Ample descriptions of their persons, manners, and customs may be found in the excellent account of the *Adventure* and *Beagle's* voyages; also in Capt. Weddell's narrative, pp. 148—156, &c.; and the voyage to the Southern Seas, by Capt. Sir James Ross, R.N., 1840-41, vol. ii., pp. 303—307; and later still in a work by Lieut. Musters, R.N., who started from Punta Arena in April, 1869, and traversed the country from South to North; also by Senor Moreno, in 1878; and in a work, "Wanderings in Patagonia," by Mr. Julius Beerbohm,

1879. In the report rendered by Lieut. Bove, 1883, in command of an Italian expedition to Patagonia, &c., the total population of Tierra del Fuego is estimated roughly at about 8,000.

They are low in stature; their colour is of a dirty copper, or dark mahogany; their only clothing is a seal or deer-skin, worn with the hair outwards. Their dwellings, sometimes styled huts or wigwams, but more fitly, by old Sir John Narborough, as "arbours," consist of a few branches. They have few articles of traffic beyond their weapons and implements as curiosities; the seal and sea-otter skins they collect must be quite insignificant for commercial purposes. They are thievish and greedy, and have become keen traders in many parts. The utmost caution is therefore requisite in dealing with, or encountering, these dangerous people.

Admiral FitzRoy, on his first voyage, in 1830, brought two boys and a girl from the South coast to England, where they were most kindly treated and educated for three years, showing much aptness, and leading to great hopes that they might be the means of ameliorating the condition of their countrymen. But within a few weeks of their restoration to their native haunts, on his second voyage, they had relapsed into their primitive barbarism. However, the impressions made were permanent, for in 1853 Capt. Parker Snow met with one of them, Jemmy Button, then a wild, naked, shaggy-looking savage, who still retained his knowledge of English, and had imparted it to his relatives, but who was unmistakeably the dangerous creature that his untutored brethren were. The noble kindness and sympathy shown by Admiral FitzRoy to these outcasts has been most unfortunately but of little avail; and the subsequent well-intended but misguided efforts of the Patagonian Mission have also failed in lessening the barbarism of these people. Indeed, they are now much more to be dreaded than at any earlier period, for they have attacked and overcome the crews of ships in passing through these channels. Thus, the *Porcupine*, of Liverpool, in January, 1853, grounded in the strait, and was attacked by a fleet of canoes; and, after a desperate conflict with the Patagonians, they were beaten off, leaving the crew terribly disabled, and the ship compelled to return to the Falkland Islands. Again, on June 6, 1862, the ship *Anne and Eliza*, from Boston, was attacked in the Straits of Magalhaens by 20 canoes, filled with armed savages, who boarded her; and in a fearful hand-to-hand combat which ensued, eight of the crew were killed, but ultimately they were beaten off with great slaughter, leaving the ship so short-handed that she was with difficulty brought to Valparaiso. In 1871, several cases of their attacking vessels were made known. In one instance four of the crew of the British brigantine *Propontis* were attacked while cutting wood at Port Gallant, and killed. The plea set up, on subsequent enquiry, was that one of the Fuegians had first been wounded. In another case an American vessel off Port Gallant was attacked by a party of natives coming off in canoes.

Capt. Mayne, speaking of the natives, says:—"From the eastern end of the

strait to Cape Froward, on both sides, the guanaco is plentiful, and as no canoes are to be found, it may be presumed that the Indians are more usually dependent on hunting than fishing for subsistence. Their fires are seen some distance inland, and the bows and arrows obtained from them seem to betoken a sport of this kind, for the arrow heads were both poisoned and unpoisoned, and it is improbable that they would waste the latter upon their enemies. Westward of Cape Froward no guanacos were ever seen, and all the Indians met with appeared to live in canoes. Deer, however, must be comparatively plentiful, as deer-skin clothing is more common than seal-skin.

From Cape Froward westward, and all up the western channels to the Gulf of Penas, the Indians appear to be of the same families, or at any rate of friendly relations on both sides of the strait. Indeed, the same faces were recognised at Port Gallant, Fortune Bay, and Messier Channel. Usually very few of them will be seen by a vessel passing through the strait, but it is extraordinary how rapidly a hundred or more will gather together if they see an opportunity for attacking boats, small vessels, or a wrecked party. How the rendezvous was known is a mystery, but fires are seen smoking all along the coast for miles, and out of every creek a canoe will be seen shooting towards the rallying point.

There is none of the graceful gliding of the North American, or of the New Zealand canoe, in these miserable boats. Instead of being propelled by paddles, they are rowed by oars rudely made of some pieces of board tied on to the end of a pole. The canoes, also, instead of being hollowed out from the trunk of a large tree into a pretty shape, or made of bark, like those of Canada, are simply planks tied together with fibres, without the slightest regard to form. On the bottom in the middle is a small fire, and on each side there will be found six or eight men, women, and children, according to the size of the boat. They are generally almost naked, the women appearing to care less about clothing than the men, though either will sell you any skin they have on for a little biscuit or tobacco.

There is one striking difference between these people and the Patagonians; the Patagonians will drink as much rum or other fire-water as they can get, and when near the settlement are always more or less drunk. The western natives, called Fuegians, could never be induced to drink spirits, wine, or beer; this difference was mentioned by FitzRoy in the voyage of the *Adventure* and *Beagle*, and on several occasions the western natives were tried with a view to proving or disproving this statement. They were offered spirits of different kinds, and wines of different kinds, but all after being tasted were put away with a wry face."

Our previous description of the Strait of Magalhaens was derived from the Sailing Directions, by Capt. Philip Parker King, R.N., 1832; and from the remarks by Capt. (afterwards Admiral) R. FitzRoy, R.N., the Admiralty surveyors of this coast. The strait was more fully surveyed in 1866-9 by Capt.

R. C. Mayne, R.N., C.B., in H.M.S. *Nassau*, and the directions are corrected accordingly, including the information gained since the last survey.

The general application of these nautical descriptions will be given in a subsequent part of the Work, in the Chapter on Passages. The Winds will also be described in the Chapter devoted to that subject.

CAPE VIRGINS, the northern entrance point of Magalhaens Strait, is 135 feet high, and in approaching the strait from the eastward is the best point to make,* and usually the first land seen. In clear weather the cape is visible from 20 to 25 miles, and when made from the northward it will appear as an extreme of land between the bearings of S.S.E. and W.S.W. Dungeness Spit or its beacon will not be visible until much nearer. When Cape Virgins bears to the westward of W.S.W., Mount Dinero will show as a small nipple, opening clear of it.

Cape Virgins and Cape Espiritu Santo have certain points of resemblance, for both are marked with cliffs, usually appearing of a white colour, forming the seaward termination of a range of hills of a moderate height, extending into the interior; and both capes have low shingle points connected with them, which reduce the width of the entrance to 14 miles from point to point.

It has been proposed to exhibit a *fixed light* on Cape Virgins, and from the height of the cape above the sea it would be visible a long distance, when established.

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* Cape Fairweather (Cape Buen Tiempo), 52 miles to the northward of Cape Virgins, and at the North entrance of the Gallegos River, bears a very great resemblance to Cape Virgins, (and also to Cape St. Vincent, on the S.W. coast of Spain). They have frequently been mistaken for each other. This error was made both in the *Adventure* and in the *Beagle*, the vessels which surveyed the coasts. Cape Fairweather was also mistaken for Cape Virgins, and the River Gallego for the entrance of the strait, by the expedition under Garcia Jofre de Loyasa, appointed by the Spanish Government in 1525, and the loss of one of the ships was the consequence (Gomara, Ist. de las Indias, p. 58). In making the land this is important, as it might occasion serious consequences. There are, however, some marks by which they may be distinguished, even if the latitude should not be ascertained. In clear weather, some hills in the interior, to the S.W. of the Gallegos River, called the Friars, the Convents, and the North Hill, will be visible; in that direction from Cape Virgins is the low shore of Tierra del Fuego. In thick weather the soundings off the respective capes will be an infallible guide; for at the distance of 4 miles off Cape Fairweather no more than 4 fathoms will be found, whereas at that distance from Cape Virgins, if to the northward of it, the depth is considerable; the bottom, also, to the North of Cape Fairweather is of mud, whilst that to the North of Cape Virgins is of gravel or coarse sand; and the latter has the long low point of shingle, called Dungeness (so named by Wallis, from its resemblace to the singular promontory in the English Channel), for nearly 5 miles to the S.W.; and, lastly, if the weather be clear, the distant land of Tierra del Fuego will be visible to the S.S.W. There is good anchorage along the whole coast between Port Gallegos and Cape Virgins, at 2 to 5 miles from the shore, but the bottom is rather stony.

Virgin Reef, which at half tide is scarcely observable, dries nearly a mile E. by N. from Cape Virgins, with 4 to 5 fathoms close outside it.

Should a vessel from the northward find the wind so strong as to prevent her entering the strait, an anchorage, quite sheltered, from South, round by West, to N.W. by W., will be found in 8 or 9 fathoms, at $1\frac{3}{4}$ mile from the shore, with Cape Virgins bearing South, and Condor Cliff W.S.W.

Sarmiento Bank, taking 10 fathoms as its limit, extends from Cape Virgins 20 miles to the S.S.E.; the shoalest water on it, exclusive of Nassau Rock, is 3 fathoms, lying 3 miles S.E. from Cape Virgins, or $4\frac{1}{2}$ miles N.E. $\frac{3}{4}$ E. from the end of Dungeness Spit.

The best route to the strait is to pass over Sarmiento Bank southward of Nassau Rock. At low water a large vessel should not cross within 10 miles of Cape Virgins, beyond which distance the soundings will be more regular than farther North.

Nassau Rock, on which H.M.S. *Nassau* struck in January, 1868, lies E. by S., $3\frac{1}{2}$ miles from Cape Virgins, and from it the extreme of Dungeness bears S.W. $\frac{1}{2}$ W., distant $6\frac{1}{8}$ miles. It is a small pinnacle, with 3 ft. at low water springs, and 3 to 6 fathoms close-to. There is a little kelp on the rock, but not enough to mark it; and, except in a gale, the sea does not break until nearly low water.

Tides.—Before entering the strait the tides should be carefully considered, as on them will principally depend whether a good or bad passage to Sandy Point be made. An anchor might be dropped, if necessary, to wait for the tide on Sarmiento Bank; but as it is quite exposed, and the holding ground indifferent, it would, if possible, be much better to get under Dungeness Spit. It has been proposed to establish a service of steam-tugs to take sailing vessels through the straits.

In passing through the strait from the eastward, it should always be borne in mind that the time of high and low water gets later as a vessel proceeds westward, until Royal Road is reached—a circumstance which considerably facilitates the navigation from East to West, and makes it easy for a vessel starting from Possession Bay, or even Dungeness, in time to catch the first of the flood in the First Narrows, to get to Royal Road or Sandy Point in a day, unless the wind is strong against her.

By taking advantage of this difference in the time of the tide, H.M.S. *Zealous*, in March, 1867, left Possession Bay at 7 a.m., and reached Sandy Point at 5 p.m., though during part of the day it was thick, with rain and a strong S.W. wind.

In the vicinity of Capes Virgins and Espiritu Santo it is high water between $8^h\ 30^m$ and 9^h a.m., whilst the stream of flood is still running to the westward into the strait, and to the northward past Cape Virgins. The main stream continues running to the westward until near noon, though the water be falling everywhere. About noon the direction of the stream changes (there being no

appreciable slack water in the channel), and until near 3 p.m. the water continues falling, while the stream of tide (ebb) is running to the eastward until after 6 o'clock.

When standing across Sarmiento Bank to the southward, the fine dark sand found outside a depth of 20 fathoms, changes to coarse slaty sand with small stones and shingle, the stones being chiefly slaty. The ridge of this bank, like almost all the banks in the strait, is shingle, while inside it, coarse sand and shingle are mixed. As a rule, the shoaler the water the coarser the bottom.

When to the northward or eastward of the bank the bottom is fine brown-gray sand, while near the latitude of Cape Virgins; but when 2 or 3 miles N.N.E. of the cape the sand is darker, and has been compared to steel filings. At 3 or 4 miles northward of the cape, a mile off shore, the bottom is shingle, but at half a mile it is clay.

In standing to the eastward from Cape Virgins fine brown sand, without shell or stones, will be found. Outside the bank, to the East or south-eastward, sand and gravel, sand and shells, or plain sand, black or gray, may be found indifferently, as also in the deep water between the bank and the coast of Tierra del Fuego; but as the water shoals on approaching the latter, the stones generally become smaller, the sand finer, and mixed with mud.

DUNGENESS is a low spit, extending nearly 5 miles from the foot of the low range of hills, from 160 to 240 ft. high, uniting Cape Virgins with Mount Dinero. Like the point of the same name in England, Dungeness is steep-to, having 20 fathoms close to the Ness. The extremity is 5 miles S. by W. $\frac{1}{2}$ W. from Cape Virgins.

Beacon.—A triangular, pyramidal beacon, 40 ft. high, and 59 ft. above the level of the sea, painted in red and black bands alternately, has been erected on Dungeness, about 150 yards from high-water mark. It is visible, in clear weather, from a distance of 12 miles, and will be seen from the northward as soon as Cape Virgins has been passed. A bank of 12 ft., about a cable in extent, was stated to have formed at $1\frac{1}{3}$ cable S.S.E. of the beacon. It was unsuccessfully searched for by the Chilian corvette *Magallanes*, in 1876.

There is good anchorage on either side of the spit, to await a change of wind or tide, or to stop at night. The bottom is stiff blue mud, which, on the East side, is thinly overlaid with stones.

East Anchorage.—In strong south-westerly winds it would be better to anchor under the lee, on the eastern side, where, though the squalls come very hard across the spit, there is no sea until the wind draws southward of S.S.W., when it becomes a leading wind into Possession Bay after weathering the spit. The best anchorage outside the spit is in 9 or 10 fathoms water, with the Ness bearing S.W. $\frac{1}{2}$ S., distant about 2 miles, and Cape Virgins N. $\frac{1}{4}$ E. The anchoring ground extends much farther to the north-eastward, but as all westerly gales draw to S.W., before dying away, it is better, if possible, to be to windward, and so, in case of the cable parting, to be able to weather the 3-fathoms

patch, and pass on either side of Nassau Rock. H.M.S. *Nassau* rode out a furious storm from the westward at this anchorage on Christmas day, 1867.

Zealous Anchorage, on the West side, is perhaps the better, as the curve of the spit enables a vessel to anchor well under the North shore, and consequently out of the strength of the tide. It will be found most convenient for a vessel bound eastward meeting with an easterly wind, to await the shift to the westward. H.M.S. *Zealous*, of 4,000 tons, anchored here in March, 1867, when bound to the westward.

A large vessel should not pass within a line between Mount Dinero and the spit end (W. by N. $\frac{3}{4}$ N. and E. by S. $\frac{3}{4}$ S.), and anchor so as to secure from 6 to 8 fathoms at low water; in anchoring anywhere in the eastern part of this strait, allowance must be made for 42 ft. rise and fall of tide outside the First Narrows, and 30 ft. inside. In this position a vessel will be sheltered until the wind veers to the southward of West, and will have no difficulty in clearing the Ness, should it blow hard from S.W. or S.S.W. There are two conspicuous sand patches on the face of the cliff, from which Dungeness projects, which look like roads; the easternmost of these should bear about N. by E. from the anchorage.

Bound Westward, quit either of the above anchorages as soon as possible after the strength of the S.W. wind is over, and reach Possession Bay, Spiteful, or Plumper anchorages, so as to push through the Narrows as soon as the wind dies away or draws to the S.E. This may be well effected by a steam vessel of ordinary speed against the tide, for westerly winds will generally be found to freshen as the flood stream commences. Westerly winds usually fall considerably about sunset, and, by being ready to take advantage of this, a vessel may frequently get through the First Narrows before dark. In the event of fog or thick rainy weather, an anchor may be dropped anywhere between Dungeness and Possession Bay, should it be necessary to wait for tide to enter the First Narrows.

Shark Creek, on the West side of Dungeness, can be entered by a boat soon after half-flood, and a small vessel might easily be hauled in to examine her bottom or make repairs.

CAPE ESPIRITU SANTO, the south-eastern entrance limit of Magalhaens Strait, on the opposite or Tierra del Fuego shore, distant 22 miles S. $\frac{1}{4}$ W. from Cape Virgins, is a steep white cliff about 190 ft. high, and is the seaward termination of a range of hills, varying from 200 to 900 ft. in height, which extends N.E. and S.W. on the South side of the straits, as far as Cape Boqueron, opposite Port Famine. Cape Espiritu Santo, from seaward, is remarkable and unmistakeable, as being the highest part of a line of white cliffs, indented by bays, which, at a distance, give it the appearance of having had gaps cut in it. As the land is approached, a remarkable detached lump of cliff, appearing like an island, will be seen in the bay South of the cape. The land must not be approached very close, as due East from the cape the low-water line extends

a mile off, while from 2 to 3 miles to the northward it dries 1½ mile from the shore.

CATHERINE POINT, the N.E. extremity of Tierra del Fuego, 10 miles N.W. by W. ¼ W. from Cape Espiritu Santo, is formed of shingle, similar to Dungeness on the opposite shore, and appears low at high water; but the difference which a change of level of 40 ft. makes in the appearance of such spots must not be forgotten.

Anchorage may be had about midway between Cape Espiritu Santo and Catherine Point, in 14 or 15 fathoms, 4 miles off shore, with the cape bearing S.S.E., and the extremity of the point West. H.M.S. *Sutlej* rode out a gale in 1863, with the point bearing S.W., and the cape S.E. ½ E. in 10 fathoms. H.M.S. *Nassau* rode out two heavy gales in 1867, with the same objects bearing W. by S. and S.E. ½ E. in 5 fathoms. Either of these positions are sufficiently sheltered from S.W. winds, but it is advisable not to bring Catherine Point southward of W. by S., as northward of that line the tide is so strong as to cause a vessel to be tide-rode even in a gale of wind, and to roll heavily. The great advantage of the anchorage between Cape Espiritu Santo and Catherine Point is, that a ship has no lee shore with any wind from N.N.W., round by West, to South.

In *Lomas Bay*, westward of Catherine Point, a vessel may find anchorage in 6 to 8 fathoms water, sand and stones, but it is not recommended, being considerably out of the way, and its approach rendered intricate by the surrounding banks, which appear to dry in all directions near the vessel at low water.

Spiteful Anchorage, eastward of Great Orange Bank, will be found a useful stopping place in westerly and especially south-westerly gales. Although a vessel may approach Cape Orange, which lies 23 miles westward of Catherine Point, on a bearing of W.S.W. to a distance of 8 miles, the unevenness of the bottom and strength of tide setting across this line render it unadvisable to do so; the best anchorage will be found in 8 to 10 fathoms, with Cape Orange bearing S.W. by W. ¾ W., Cape Possession N. ½ W., Direction Hill W. ¼ S., and Mount Aymond N.W. by W. ¾ W.

Great Orange Bank buoy, conical, and painted *black*, with staff and *white globe*, lies in 4¾ fathoms, on the N.E. side of Great Orange Bank, with Cape Possession bearing N.E. by N. ¼ N.; Mount Aymond, N.W. by W. ½ W., westerly; Direction Hills, W. by N., northerly; and Cape Orange, S.W. ½ S. This buoy must not be approached nearer than 1 mile; it is small, and liable to be shifted by the tide. In 1880 it was reported to have disappeared altogether.

Mount Dinero is a conical hill, 280 ft. high, and 8 miles to the westward of Cape Virgins. From thence the land continues between 200 and 400 ft. high, rather level topped, and generally covered with grass and scrub to Cape Possession, where it turns in to the north-westward. This part of the coast is

fronted by a shore of mud and stones, with rocky ledges off the points, which dry at low water, from a quarter to half a mile off. At 3 miles eastward of Cape Possession there is a remarkable bare sandy patch, making a good mark for bearings.

Walbis Shoal, with only 9 ft. water on it, lies W. $\frac{3}{4}$ S. nearly 10 miles from Dungeness. It is connected with the main land, and no vessel should pass North of it. Cape Virgins, bearing N.E. by E. $\frac{1}{4}$ E., and well open South of Cliff Hill, leads outside it. Mount Aymond, bearing W. $\frac{1}{4}$ N., and open South of Cape Possession, also clears it.

CAPE POSSESSION, 20 miles W. $\frac{1}{4}$ S. from Dungeness, is a bold, perpendicular headland, rising 385 ft. above the sea, the face of which is deeply furrowed. It is the centre one of a wavy line of cliffs, is higher, and has a darker coloured base, than either of those adjoining. The land behind it dips so much that the cape makes as an island at 15 or 20 miles distance on either side.

Beacon.—About half a mile to the westward of Cape Possession, 350 ft. above the level of the sea, a triangular pyramidal beacon, 40 ft. high, has been erected. It is painted in red and white bands alternately, and is visible, in clear weather, from a distance of 20 miles.

POSSESSION BAY, extending from Cape Possession to the entrance of the First Narrows, has anchorage all over it, though open to winds from the southward of S.W. *Stonewall anchorage*, in the eastern part of the bay, with a bottom of stiff blue mud, is well sheltered from the East, and, being free from strong tides or high sea, is safe in any wind. A berth may be selected anywhere from 2 to 6 miles westward of the cape; the best berth is with Direction Hill bearing S.W. $\frac{1}{2}$ W., and the extreme of Cape Possession E. $\frac{1}{2}$ S., nearly in line between the cape and Mount Aymond. Farther out the holding ground is not so good.

During westerly winds a convenient anchorage may be had farther to windward in the western part of the bay. A large ship steering for the anchorage should take care not to bring Mount Aymond to the northward of W. by N. $\frac{1}{2}$ N., so as to clear the eastern edge of the Narrow Bank; nor should Direction Hill be brought to the southward of S.W., as the shoal water extends a long way out in the North corner of the bay. Coming from the westward, the land eastward of Cape Possession should not be shut in by it until the above bearing of Mount Aymond is so. Smaller vessels will find a good berth 2 miles southward of Tandy Point, with Mount Aymond bearing N.W. by W., and Direction Hill S.W. by S. $\frac{1}{4}$ S. More tide will be felt at this anchorage than in the eastern part of the bay.

The watering place, $1\frac{1}{4}$ mile West of Tandy Point, is a small pond of good water, just inside the high line of the beach. Like all the fresh-water ponds along the coast, if carefully approached, some ducks will probably be found in

it. There is no available water between Tandy Point and St. Jago Bay, but watering would be easier in St. Jago than in Possession Bay, owing to the heavy surf.

Narrow Bank stretches nearly 9 miles to the N.E. of Direction Bank, and inside it to the westward is another bank of fine sand, which dries at low water. It may be crossed between half-flood and half-ebb, but this should not be done except in case of necessity.

Narrow Bank buoy, conical, and painted *red* (with Banco Narrow, No. 2, in black letters), with staff and *globe*, lies in 7 fathoms on the S.E. edge of Narrow Bank, with the following approximate bearings: Mount Aymond, N.W. $\frac{3}{4}$ W.; Cape Possession, N.E. by E. $\frac{1}{4}$ E., easterly; Direction Hills, S.W. $\frac{3}{4}$ W., westerly; and Cape Orange, S. $\frac{1}{2}$ E. Vessels passing to the southward of Narrow Bank should not approach the buoy nearer than 1 mile, and passing on the North side of the bank should give the buoy a berth of about $1\frac{1}{2}$ mile. It is reported to be frequently out of position. In March, 1881, it had drifted 2 miles to the N.E.

Plumper Anchorage is formed by the ebb stream through the Narrows, which turns round the East edge of Direction Bank into Possession Bay. It is an indifferent anchorage, as recent examination shows that the banks there have shifted considerably during the last few years, and the tide runs 5 knots; the water also shoals suddenly both towards the Direction and Narrow Banks. To reach this anchorage, steer for Mount Aymond, bearing N.W. $\frac{1}{2}$ N., making allowance for the tide, till Direction Hill bears W.S.W., when there will be about 13 fathoms at low water. The anchor must be let go immediately the bottom is obtained, as any delay may put the ship in 2 or 20 fathoms, according to the tide.

Mount Aymond, nearly 8 miles inland to the north-westward of Possession Bay, is 867 ft. high, and has near it to the westward four sharp rocky summits, called the *Four Sons of Aymond*, or *Asses' Ears*. The mount forms an excellent mark when advancing towards the First Narrows from the eastward, and can also be seen for some distance westward of them. The appearance of the Ears change much according to their bearing; on some bearings all are seen, and on others only one.

Direction Hills will be seen as soon as Cape Possession is passed; they appear (as do the hills near Cape Orange) like islands. When approached on a S.W. by W. $\frac{3}{4}$ W. bearing, about 10 miles distant, they show on a lighter background of about the same apparent elevation; the northernmost and highest hill, 224 ft. above the sea, is the best object to steer for on the above bearing in order to gain the fairway of the First Narrows. On this is placed a *triangular pyramidal beacon*, 40 ft. high, painted in black and white bands, visible, in clear weather, at a distance of 18 to 20 miles.

CAPE ORANGE, about $8\frac{1}{2}$ miles S.E. of Direction Hills, terminates in a sharp conical hill, 152 ft. high, and is unmistakeable. As the cape is approached,

a remarkable white patch of cliff will be seen on the East face of it. Spiteful Anchorage and the buoy have been previously described.

Angle Hill, 124 ft. high, at about 3½ miles S.W. of Cape Orange, is conspicuous, and, like Cape Orange, conical in appearance, with a sharp, well-defined apex.

At the West entrance to the First Narrows *Barranca Point*, on the North side, may be known by its low cliffs, the only ones in the vicinity. *Baxa Point* is difficult to distinguish, except on a bearing of S.E. by S. nearly, when it appears as an extreme point of land on the South side of the West entrance to the First Narrows. Baxa Point lies 4¼ miles E. by S. ½ S. from Barranca Point, and may be known by being the fourth cliff from the southward, having some V-shaped gaps in the cliffs to the northward. It is now, also, marked by a beacon. *Dixon Hill*, about 8 miles South of Angle Hill, is 232 ft. high, but cannot be seen until open South of Baxa Point, unless the eye be at an elevation of 26 or 30 ft., when the top of the hill will be visible over Baxa Point bearing E. ¼ S. Dixon Hill will be seen in clear weather at a distance of about 20 miles, and may be known by having two summits slightly rounded.

FIRST NARROWS.—This channel is 10 miles long and 2 miles broad, with cliffy shores, and an average depth of 40 fathoms; it affords no anchorage, except on the coast between Anegada and Espora Points, where a schooner or small vessel may anchor out of the tide, which sets at the rate of 5 to 7 knots in the Narrows.

Directions.—From a position about a mile S.S.E. of Dungeness, a W. by S. ¼ S. course for 30 miles, making due allowance for tidal influences, will lead nearly 2 miles clear of a detached 2-fathoms patch, the northernmost of the dangers off Great Orange Bank; and when Cape Orange bears S. by W., or Mount Aymond N.W. by W., the course may be altered to S.W. by S., which will lead midway between that part of Great Orange Bank off Anegada Point and Direction Bank on the western shore.

In the above route from off Dungeness, a bearing of Direction Hill will, when in sight, ensure keeping clear of Great Orange Bank, and Sutlej Hill open South of Direction Hill, S.W. by W. ¼ W., leads about 1 mile South of the Narrow Bank buoy; but it is to be remembered that in a region of proverbially bad weather, such intricate navigation, and strong tidal streams, increased caution is necessary, and determining a ship's position frequently becomes an absolute necessity.

Delgada Point and Direction Hill in line, bearing N. ¾ W., also Mount Aymond and Direction Hill in line bearing N. by W. ½ W., will be good marks for checking the position in running through the First Narrows.

Both shores in the Narrows are steep-to, but it is better to keep on the North side, as Anegada Point dries out a long way. From a position midway between Nuñez Head, a triangular cliff 95 ft. high, projecting from the North shore, and Mendez Point, a S. by W. ½ W. course should be steered for 10 miles, avoiding

Satellite Patch, which lies nearly a mile S.E. by E. from Barranca Point. It has 3 ft. on the shoalest part at low water, and is usually marked by kelp. The outer edge is steep-to, but its inner edge joins Barranca Point.

After passing the First Narrows, the strait opens out to a width of 15 miles, forming two bays, *Philip Bay* on the South, and *St. Jago Bay* on the North, and continues at that width for 20 miles, when it again narrows between St. Isidro Point and Cape Gregory, and the Second Narrows commence.

Barranca Bank extends from a mile S.W. of Satellite Patch, nearly in a line with the coast, and occupies the whole N.E. part of St. Jago Bay. Good anchorage may be had in easterly winds on the West edge of this bank.

Triton Bank is the next danger to the south-westward of Barranca Bank, and lies nearly in the track midway between the Narrows. When first examined in 1834 it was of small extent, and had 2 fathoms on its shoalest part, but since that time it seems to have increased and shoaled to $1\frac{1}{4}$ fathom, while *Tribune Bank* has formed to the westward of it. The depth of 2 ft. reported on Triton Bank by H.M.S. *Satellite* is believed to be an error. The *Nassau* was anchored on it during two spring tides, and passed it frequently in all weathers, without a break ever being seen. The shoalest part bears E. by N. from the shoulder of Gregory range. When abreast of the bank, *Sutlej Hill* (509 ft. high) will begin to show out clear of the range at the back, forming a good mark; and in some lights *Useful Hill* (176 ft.), one of the several peaked hillocks in this vicinity, will also be seen as a small double hill close to the shore of St. Jago Bay, and over Valle Point; and in clear weather Gap Peak will be seen to the southward.

Triton Bank buoy, conical, and painted *red* (with Banco Triton, No. 1, in white letters) with staff and *white globe*, lies in 4 fathoms, on the southern edge of Triton Bank, with Useful Hills bearing N.W. by W., westerly; Gregory Shoulder, W. by S.; Cape Gregory, S.W. by W. $\frac{1}{4}$ W.; Dixon Hill, E.N.E.; and Gap Peak, S.E. $\frac{1}{4}$ E., easterly. Vessels passing Triton Bank should give the buoy a berth of one mile. Too much dependence must not be placed on its being in position.

It may be remarked that all over this eastern portion of the strait the most remarkable difference takes place in the appearance of the land, according to the light in which it is seen. In thick weather the left shoulder of Gregory range will appear frequently through the mist. A bearing of it will show the progress made; if the lead be kept going, and the course attended to, no danger will be apprehended, for if soundings are obtained under 12 fathoms after hauling up for the Second Narrows, it is evident that the ship is too far to the northward, and should be edged away a little, as no such soundings could occur to the southward, unless a vessel was a long way out of the track, and it is highly improbable that such an error would occur where the tide sets almost directly in line with the course. H.M. ships *Zealous* and *Nassau* went

through this part of the strait in very thick weather, with the tide, in March, 1867, without getting bottom from the chains or once easing speed.

Nothing but sand was found on Triton Bank, being an exception to the general rule of the shoalest parts, which are almost invariably composed of shingle. The tide sets strongly over it, and there is usually a ripple near the shoalest part.

Tribune Bank lies nearly 8 miles S.W. by W. from Triton Bank, and has 3¼ fathoms water on it. A vessel hauling in for an anchorage in Gregory Bay should keep the Cone well open of Cape Gregory till Gregory shoulder bears W. ½ N., when she will pass to the westward of the bank. Here, as elsewhere, allowances must be made for the tide.

The shoal reported by H.M.S. *Termagant* and *Grappler* in 1860, and searched for by H.M.S. *Satellite* in the same year, has again been searched for in vain. H.M.S. *Chanticleer*, in December, 1874, searched in vain for a rock, reported by the mail steam-vessel *Lusitania*, said to lie with Cape Gregory bearing W. by S. ½ S., and St. Isidro point, S.W. by S.

St. Jago Bay.—Anchorage has been mentioned in this bay to the westward of Barranca Bank, and to this it may be added that there is anchorage all over the bay in depths varying from 5 to 20 fathoms.

Proceeding westward, if, on passing Barranca Point, it be decided that Gregory Bay cannot be reached, a ship should continue the mid-channel course until two miles beyond Satellite Patch with the ebb stream, or a mile with the flood, and then haul in for Gregory shoulder, or about W. by S. ¾ S. This will lead inside Triton Bank, and clear of Barranca Bank, when the land can be closed if it be desired to anchor; or the shore can be approached to within 1½ mile, and followed along, and the vessel anchored anywhere between Valle Point and Gregory Bay. Irregular changes of 1 or 2 fathoms in the soundings must be expected, as the bottom is uneven all over the bay. *Valle Point* is steep, and, with the hillocks above mentioned at its back, will not easily be mistaken. At 2½ and 4 miles eastward of it there are watering places, which a ship can approach within a mile, and streams will be found at short distances all along the bay.

It is high water, on full and change, in St. Jago Bay, at $9^h\ 27^m$; springs rise 20 ft., neaps 15 feet.

Gregory Bay.—The anchorage in this bay commences about 2½ miles N.N.E. of Cape Gregory, which is 209 ft. high, and a vessel should not go inside this line, *i.e.*, the extreme of the cape bearing S.S.W. The low-water line of the beach dries out three-quarters of a mile from the high-water mark, and follows nearly in the same direction round the bay. As the heaviest and most prevalent gales begin from the North or N.W., it is advisable to anchor well under the North shore. Good berths may be had, with the Hummock anywhere between W. by S. ½ S. and S.W. by W. ½ W., from 1 to 2 miles off

shore, in 13 or 16 fathoms, sand and shells, or farther in with Cape Gregory bearing S.S.W. in 9 fathoms, soft muddy bottom.

Tides.—It is high water, on full and change, in Gregory Bay, at $9^h\ 30^m$; springs rise 21 ft., neaps 12 ft. The time of the turning of the flood stream here with reference to the Second Narrows seems doubtful. It has been stated that it turned $2\frac{1}{4}$ or 3 hours earlier at the anchorage than in the Narrows; though several trials have shown this to be the case sometimes, it is not always so, and it is probable that the turning of the stream depends on the wind and the position in which the ship is anchored. In weighing for the westward with the tide, proceed well out into the Narrows before keeping away, to avoid being swept round into shoal water S.W. of Cape Gregory.

Cape Gregory has on it a pyramidal skeleton *beacon*, 55 ft. high, and painted *red*. It stands low, near the extremity of the cape, and is not easily seen in approaching from the eastward. It was stated to be elevated 115 ft. above the sea, and visible 16 miles.

Philip Bay comprises the whole of the South shore between Baxa and St. Isidro Points; in it are several anchorages, but they are more exposed to the prevalent winds than those in St. Jago Bay. A vessel may, however, find shelter from the S.E. winds, with Baxa Point bearing North, distant $3\frac{1}{4}$ miles, and Gap Peak S.S.E.; or $5\frac{1}{2}$ miles beyond the point on the same bearing, with Gap Peak S.E. by S. $\frac{3}{4}$ S. A vessel leaving this anchorage for the westward with a fair tide, should steer for Gregory shoulder, or she will be set down on the foul ground at the head of the bay.*

On a hill, three-quarters of a mile inshore from *Baxa Point*, is a triangular pyramidal *beacon*, 40 ft. high, surmounted by a staff and cross. That side of the beacon facing First Narrows is painted white, and that towards Second Narrows red. It should be visible 15 miles from the westward in clear weather. The Indians destroyed this beacon in 1876, but it was rebuilt.

There is anchorage under St. Isidro Point, well sheltered from S.W., but *Barnacle Reef*, of $2\frac{3}{4}$ fathoms, 3 miles eastward of the point, should be carefully avoided. To anchor bring Double Peak to bear S. $\frac{1}{2}$ W., and steer for it on that line until Gregory shoulder bears W. by N. $\frac{1}{2}$ N., or the Cone West. This bearing leads over the tail of the Barnacle Reef in 10 fathoms, sand and shell. A vessel caught by the ebb tide too late to cross to Gregory Bay, or to reach Royal Road, may find this a convenient stopping place. Along the centre of the bay shoal water extends a long way off.

The land on the South shore of Philip Bay is low, with a row of small hills like those on the North side fringing the coast, behind which the land gradually rises towards the range of high ground, of which *Gap Peak*, 925 ft.

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* The under current here seems to be stronger than that on the surface; on one occasion, when the *Nassau* was riding easily to the ebb tide, two sounding leads lashed together, and making 85 lbs. weight, would not rest on the bottom in 10 fathoms water.

high, forms the only point useful to the mariner. In some lights the coast hills stand out clearly, but generally the land appears to slope from the beach to the back range.

St. Isidro Point, at 5½ miles S.E. ¼ E. from Cape Gregory, low and sandy, with a reef off it, forms the south-eastern point of entrance to the Second Narrows. Under St. Isidro Point, and in the bight to the south-eastward of it, there is good anchorage; but the bank near that point shoals suddenly, and the western tide sets strongly towards the shoal point, which should be well guarded against.

SECOND NARROWS, lying S.W. 20 miles from the First Narrows, are about 12 miles long and 4 to 6 miles broad. On the North side the land falls back from Cape Gregory, and forms a large bight, in which there is a sand-bank 1½ mile long that dries at low water, with its East end 1½ mile westward of the cape. At 5½ miles westward of the cape is the East end of *Halfway Shoal*, lying parallel to the shore; it is a mile in length, and has 3¼ fathoms on it. The soundings between the shoals are from 6 to 10 fathoms. *Susannah Cove*, inside these shoals, and 4 miles from Cape Gregory is only fit for boats. Beyond Halfway Shoal the North shore is bordered by a bank, which near Gracia Point extends off a long half mile, with 1 fathom water on it, and steep-to. These banks are the only dangers of the Second Narrows.

The South shore is higher than the North and steep-to, but after passing Halfway Shoal, when the Cone will bear N.N.W., a vessel should incline to the North shore to avoid being swept into Lee Bay by the flood stream, or to get out of the strength of the ebb, both which make with great strength off Cape St. Vincent.

A vessel navigating the South side with a fair tide should steer from St. Isidro Point to Gracia Point, edging away gradually for Elizabeth Island, as she passes Sweepstakes Foreland. Having reached Cape St. Vincent there are three routes to the southward, two of which are available for the largest ships. These are Queen Channel, close to the East side of Elizabeth Island; the passage through Royal Road and South of Elizabeth Island; and New Channel, eastward of Sta. Marta and Magdalena Islands.

Large ships should use the Queen or New Channels; no vessel drawing more than 18 ft. should attempt the passage through Royal Road. Queen Channel is the one most generally used.

It is high water, on full and change, at Gracia Point, at $10^h\ 17^m$; springs rise 8 ft., neaps 7 feet.

Queen Channel.—A vessel intending to pass through Queen Channel should, from a mid-channel position in the western part of the Second Narrows, with Cape St. Vincent bearing South, steer for the N.W. extreme of Elizabeth Island, which shows as a bluff, observing that Sylvester Point, the N.E. extreme of the island, in line with Alfred Point bearing S. by W. ¼ W., leads to

the westward of the 2-fathoms patch lying N. by E. ½ E., 2½ miles from Santa Marta Island, and when the East extreme of Santa Marta Island touches the West extreme of Santa Magdalena Island, bearing S. by E. ½ E., steer S. ½ W., passing Sylvester Point at 2 or 3 cables distance, until the S.E. side of Santa Marta touches the West extreme of the land at Cape St. Vincent, bearing N.E. by N. ½ N., keep the latter mark on astern until Cape Thorax, the South extreme of Elizabeth Island, bears W. by N., when all dangers will be passed, and a course can be shaped for Sandy Point. The tide sets up and down this channel, and with the land so close, thick weather need not impede the progress of the ship; the only possible danger is that of keeping away to the North end of Elizabeth Island too soon, by which a vessel is likely to be set on the shoal extending N. by E. ½ E., 2½ miles from Sta. Marta Island.

New Channel.—If bound through the New Channel, from a position midway between Cape St. Vincent and Gracia Point, a S.S.E. course leads straight through the New Channel, which in no part is less than 3 miles wide, and has nowhere a depth of less than 20 fathoms. Keep in mind that Cape St. Vincent in line with the cone bearing N. ¾ W., leads to the westward of New Bank, and East of the shoal ground off Sta. Magdalena Island. The objections to this passage are the tides, which for 2 or 3 miles southward of Cape St. Vincent run E.N.E. and W.S.W., and directly across the course, rendering a vessel liable to be set either on to the New Bank or the shoal already mentioned as extending from Sta. Marta Island. The strength of the stream here is also much greater than would be expected from the expanse of water, and reaches fully 6 knots at springs, even when not aided by the wind. As a vessel proceeds the flood stream inclines more and more southward, till, when approaching foul ground, which is marked by kelp off Sta. Magdalena Island, it will be found setting S.S.W., or towards the danger.

The third channel mentioned is through Royal Road and Pelican Passage which in places has only 4½ fathoms water. Its only use is for a vessel intending to anchor in Royal Road, and wishing to get as far on as possible before anchoring, so as not to lose ground in the morning.

Elizabeth Island, so named by Sir Francis Drake, is 7½ miles long, and increases in width from half a mile at the North end to 2 miles at the South. The highest elevation on the island is 178 ft. There is good anchorage in about 7 fathoms water off its N.E. end, with Gracia Point bearing N. by E. ¼ E., and the North extreme of the island in line with the S.W. extreme of Sta. Marta Island E. by S. A large ship should anchor farther off, in 9 fathoms, with Gracia Point bearing N. by E., and Sylvester Point S.E.

On the East side of Elizabeth Island, abreast a remarkable gap, between Sylvester and Alfred Points, anchorage may be obtained in 8 fathoms, coarse sand and shells (out of the strength of the tides), with Sylvester Point bearing N. by E. ¼ E.; the centre of Santa Marta Island N.E. by E.; and a small hill on Santa Magdalena Island S.E.

In anchoring after dark, allowance must be made for the tide setting the ship out into the channel, and should Elizabeth Island appear very close without soundings, the vessel is sure to be too far to the eastward, and should, therefore, edge to the westward until a proper depth is obtained.

During the breeding season (from September to January) this island is covered with swans and geese, and their eggs may be obtained or the birds shot in great quantities, the spring being the best for the swans, who vacate the island for the geese in November.

Royal Road, into which the Second Narrows open, is formed by the West side of Elizabeth Island and the mainland. The *Middle Ground*, having on the shoalest part 2½ fathoms water, lies nearly halfway between Sylvester Point and Peckett Harbour, and is the only danger in the North part of the road. Vessels may anchor in security and out of the strength of the tide in any part of the road, though the anchorage already mentioned off the N.W. end of Elizabeth Island seems the best. It has been said that no vessel drawing more than 3 fathoms should use the passage through Royal Road, as the deep-water channel through Pelican Passage is intricate, and the tides strong; when the wind and tide are against each other, they cause a dangerous race, with a sea 5 or 6 ft. high, between Cape Thorax and the main.

A vessel of moderate size may, however, pass eastward of the Middle Ground, keeping along the West side of Elizabeth Island at half a mile distant, until Cape Thorax bears about E. by S. ½ S., and the passage is well open, when steer for Cape Porpesse, to avoid being set into the shallow water off Shoal Haven. There is anchorage on the North side of Cape Porpesse, but, with S.E. winds, Laredo Bay is preferable.

It is high water, on full and change, in Royal Road at $9^h\ 47^m$; springs rise 8 feet.

Oazy Harbour, 1½ mile westward of Gracia Point, is 1½ mile long. The entrance is narrow, and when inside there is a space of only a quarter of a mile in extent, in which a vessel could anchor. All the rest is dry, or nearly dry, at low water, and exposed to winds between S.W. and South. Fresh water could not be obtained except at high tide, and then with difficulty.

Whitsand Bay, adjoining Oazy Harbour to the westward, affords anchorage in 2 to 4 fathoms water, well sheltered from westerly winds.

Peckett or Pecket Harbour, in both of which ways old writers spell the name of Narborough's lieutenant, after whom it is called, is 5 miles southward of Oazy Harbour, or 7 miles from Gracia Point, and though the anchoring ground in it is confined, steam-vessels may pass in and out easily. Although apparently completely sheltered, a disagreeable sea gets up quickly in this harbour with westerly winds, making it dangerous for boats. The distance between the two points forming the apparent entrance is 1½ mile. Two arms run in from the West side of the harbour, the southern of which is nearly

blocked up at low water; the northern is deep, and runs nearly 2 miles into a large shallow lagoon.

The tide makes with considerable strength through this inlet, but loses some of its force on entering Pecket Harbour, in which, though the flood tide is strong, the ebb is not much felt. There is good anchorage in 6 or 7 fathoms, outside the entrance, South of Pecket Point, also between Oazy and Pecket Harbours in 6 or 7 fathoms, with Cape St. Vincent bearing E. ½ N., and Sylvester Point S.E. by S. ½ S.

Santa Marta Island, lying 1⅓ mile East of Sylvester Point, is only a third of a mile long, and its sides of perpendicular cliffs rise 100 ft. above the sea. A reef extends N. by E. ½ E. 2¼ miles from its North side, terminating in a patch marked by kelp, with only 2 fathoms water on it; there is only 7 fathoms, nearly a mile N.W. of it, while on the South side the depth of 6½ fathoms was obtained, close to 28 fathoms, 1¼ mile from it.

Marta Bank Buoy, conical, and painted *black* (with Bajo Marta, No. 4, in white letters), and surmounted by a *cage*, lies in 4¾ fathoms, on the East side of the 2-fathoms patch, with Gracia Point bearing N. by W. ¾ W., westerly; the North point of Santa Magdalena Island S. ¾ E., easterly; and the centre of Santa Marta Island S.S.W.

Santa Magdalena Island, 4 miles S.S.W. of Sta. Marta, lies N.E. by N. and S.W. by S., and is a mile long, by half a mile broad. It has four or five small hills, by which it cannot fail to be recognised, especially when coming from the westward, the highest of which, at the S.W. end, rises 136 ft. perpendicular from the water. As Elizabeth Island is the favourite haunt of swans and geese, so is Sta. Magdalena Island for cormorants, penguins, sea-lions, and seals.

The 10-fathoms line of soundings extends nearly 1½ mile North and South, and 2 miles East and West around this island, and it should not be closed inside this line by a passing vessel. There is an anchorage in 6 or 7 fathoms half a mile S.E. by S. of the South end of Magdalena, well sheltered by the island between North and West. During South and south-easterly winds good anchorage may be obtained in about 7 fathoms, sand and shells, on the bank extending from the North side of the island; here the flood sets S.W., and the ebb NE.

Walker Shoal, between Sta. Magdalena and Elizabeth Islands, lies nearly North and South, and is 4 miles long by 1 mile broad. It is divided into two parts, with deep water between them. The least depth is 3¼ fathoms, which bears N.E. by E. ½ E., distant 3½ miles from Cape Negro. Vessels may pass either side of this shallow patch, but the West side is preferable.

Lee Bay, southward of Cape St. Vincent (the South point of the Second Narrows) is useless, dangerous, and much to be avoided. *New Bank*, 4 miles long by 1¼ mile broad, has only 7 ft. water on it, and lies S.S.E. from Cape St. Vincent.

Quarter-Master Island, lying across the entrance of Gente Grande Bay, is crescent-shaped, and 70 ft. high. A long spit dries off more than a mile from its N.E. end. The South end of the island is formed by a sand spit, covered with grass, inside which there is anchorage in 5 to 7 fathoms. There is a deep channel on either side of Quarter-Master Island. *Gente Grande* (or Tall People) *Bay* is shoal and unfit to enter, and the shore around it is low and dangerous.

Southward of Gente Point, along shore to Capes Monmouth and Boqueron, there is no danger; the water is deep, and the coast safe to approach. About 4 miles North of Cape Monmouth is *Porvenir Bay*, said to be a suitable anchorage for small vessels. The entrance is 3 cables wide, the bay extends 2 miles in an easterly direction, and is clear of shoals for half a mile in, where a bank $2\frac{1}{2}$ cables long, with 3 ft. water over it, obstructs the channel. The passage North of this bank is the better, and has 3 fathoms in it; the bank being passed, the channel narrows to 1 cable in width between two low points, having $3\frac{3}{4}$ fathoms between them. The bay then widens to 8 cables in diameter, the best anchorage being in the centre, in $4\frac{3}{4}$ fathoms, mud, sheltered from all winds.

Beyond Cape Monmouth, a cliffy point, and nearly 30 miles from Gente Point, is *Cape Boqueron*, a precipitous headland forming the abrupt termination of the high land extending across the country from Cape Espiritu Santo. The shoulder of this range over the cape forms a most conspicuous mark from the neighbourhood of Sandy Point.

LAREDO BAY, on the western side of the strait, and to the South of Cape Negro, is the easternmost anchorage in the strait where wood can be obtained, though, with the larger and better wood at Sandy Point so near, a vessel would scarcely stop here for the purpose of wooding only. The bay, however, offers a secure anchorage when there is any westing in the wind; and with easterly winds, which are uncommon, and seldom blow with violence, no danger need be apprehended if the ground tackling be good, as the depth of water is easy, and the bottom sand and mud.

In entering, a vessel should keep well on the North shore, as there is a ledge of rocks off the southern point; but Cape Porpesse should not be passed too close, as there is a 5-fathoms patch nearly a mile off it. The best anchorage is in the N.W. corner.

Tides.—It is high water, on full and change, in Laredo Bay, at 11^h; springs rise 7 ft. When to the southward of a line drawn from Laredo Bay to Gente Point, the tide streams are scarcely felt; but to the northward of that line they are strong, and must be carefully guarded against during the night, or in light winds. A vessel in mid-channel, between Gente Grande and Laredo Bays, would be set by the ebb tide, if the wind failed her, directly amongst the dangers surrounding Santa Magdalena Island.

SANDY POINT, a low projection covered with grass and with a few trees on its inner part, extends more than a mile from the general direction of the coast, but to the East and S.E. less than 3 fathoms will be found 1¼ mile from the end of the spit.

La Colonia de Magalhanes.—At 2½ miles southward of the point is the Chilian settlement, originally founded in 1843, and called *Punta Arena*, after the point. The settlement, a single street of one-storied wooden houses, is built on the summit of a bank, about 35 ft. high, in front of which is a large flat formed by the deposit of a river, which runs past it on the North side, and charged with sand from the hills to the westward, down which it descends with great force in seasons of heavy rain, overflowing all the plains between the settlement and the water. A raised road has been made across this level to the water's edge, where two boat houses have been built. A pier, constructed on piles, extends 130 yards S.E. from the boat houses.

The population of the colony in 1868 was 195; in 1874 it numbered 800, of which 100 were convicts. This increase was due to the greater demand for coal, and also the finding of gold in the neighbourhood. In 1876, it contained about 1,200 or 1,300 inhabitants. There is a good sale of guanaco skins (which are brought here by the Indians), a few fur seal skins, some gold and silver; but coal is the chief article.

Until lately, Punta Arena was kept merely as a penal settlement, and was fast falling into a state of decay; but in consequence of the rapidly increasing traffic of late years through the strait, and the line of mail steam-vessels between Valparaiso and Europe adopting this route, the attention of the Chilian Government was drawn to the importance of the station as a place of call and supply. Accordingly, at the beginning of 1868, grants of land and other advantages were promised to immigrants, and in January a new governor arrived with some 500 settlers. The Pacific Steam Navigation Company's steam-vessels call here four times a month, twice from England, and twice from Valparaiso.

Sandy Point is not easily distinguished from a vessel far out in the channel, as the houses do not show well against the dark background. A white patch to the northward of Catalina Bay will, however, generally be easily seen, and if the hills South of the settlement be clear of mist, there is a remarkable white patch on the side of one of them, which is a good guide.

In clear weather, long before Sandy Point is reached, indeed before a vessel gets through the Second Narrows, the high mountains on Dawson Islands and Mount San Felipe will be seen forming an apparent barrier, blocking up the passage, and over the latter the summit of Mount Tarn stands out in bold relief against the sky, forming a mark to guide the mariner through the Broad Reach.

The view presented by these mountains from the anchorage off Sandy Point is a magnificent one, and the spectator feels as if he were entering upon a

totally new description of country from that passed in coming from Cape Virgins.

Lights.—At half a mile within the entrance to the river is the blockhouse, a square building 79 ft. high, painted in red and gray bands. From it is shown a *fixed bright* light, elevated 41 ft., and visible about 10 miles, between N. ¼ E. and S. by E. ¾ E. through East. A *fixed red* light, elevated 69 ft., and visible 3 miles, is shown from a white cupola, 29 ft. high, supported on two uprights, about 20 ft. westward of the battery flagstaff, to show the anchorage ground. The two lights in line bear N.W. ½ N., but are sometimes not exhibited. Vessels from the northward should not steer for the anchorage till the bright light bears northward of W. ¼ N., when a W.S.W. course may be steered till the red light is seen; they may then be brought in line and anchorage taken up in from 10 to 5 fathoms, as convenient. From the southward the bright light should be kept well on the port bow until the red light becomes visible.

Buoys.—A *red buoy*, with a ball striped *white* and *red* alternately, lies in 7 fathoms, on the eastern edge of Sandy Point Spit, with Sandy Point lighthouse bearing about S.W., 2½ miles. This buoy must be passed by large vessels at 2 cables distance, but small craft may near it without danger; it is, however, liable to be out of position. The spit is reported to be extending to the eastward.

A *white spar buoy*, 10 ft. high, having a diamond-shaped head, painted green, is moored in 9 fathoms over the outer part of the wreck of H.M.S. *Doterel*, sunk in Sandy Point Road, with Sandy Point bearing N. by E. and the Cemetery Cross W. ½ N. A square *red* buoy marked the inner side. The *Doterel* was destroyed by the explosion of her magazine on April 26th, 1881.

Tides.—It is high water, on full and change, in Sandy Point Road, at 12^h; springs rise 5 ft., neaps 4 feet.

The anchorage is good and well sheltered with the prevalent West and S.W. winds, and easterly or south-easterly gales rarely blow home so as to make it unsafe.

A vessel making for the anchorage should not close the land until the flagstaff or white cupola bears to the northward of W. by N., to the southward of which line is the best anchorage. From a mile off shore on that bearing, a vessel may steer in W. by S. for the Cemetery Cross, till the flagstaff bears N.W. by W., anchoring in 5 or 6 fathoms water. A large vessel, from the same position, should steer in West, and anchor in 10 fathoms, with the flagstaff N.W. The chart and lead are, however, sufficient guides, and the anchorage is clear to the southward of the settlement. By night, good anchorage will be found in 10 or 12 fathoms, with the bright light between the bearings of N.N.W. and W.N.W., or with the lights in line as before explained.

Landing.—The moment the wind has any easting in it, a surf sets in on the

beach, where landing will be found difficult or impossible in the winter months, when it is perfectly fine in the channel. The pier has been before described.

Supplies.—Wood and water are plentiful, and the former excellent for steaming purposes. An ample supply of fish may be caught near the mouth of the river North of the settlement. The seine should be hauled at the commencement of the flood tide. Cattle and vegetables have always thriven well, and may usually be readily procured.

Coal was brought from the pits, a distance of about 5 miles, on tramways, and supplied to vessels in launches at £2 per ton, in 1872. The working of this coal only began in 1860 ; in the first six months of 1874, steam-vessels were supplied with 4,000 tons of it. The mines were worked by a private company, but were stated to have been abandoned in 1877.

The Pacific Steam Navigation Company's agents have a coal hulk here for supplying steam coal of the best quality. During fine weather vessels may coal alongside the hulk, or with lighters if necessary. Ships' stores of all descriptions, vegetables, fresh meat, and live stock, can also be obtained from the Company's agents.—*Captain Maclear*, H.M.S. *Alert*, 1880.

Southward of Sandy Point, as far as St. Mary Point, good anchorage may be had three-quarters of a mile from the shore, in 10 and 12 fathoms, sand and shell over clay. At the edge of the kelp which fronts the shore there is 5 and 6 fathoms, so that with the wind off shore a ship may anchor or sail along it close to the coast by keeping outside the kelp.

Squalls off the land are very strong, so much so sometimes as almost to lay a ship on her beam ends, and these usually come on without any warning whatever; it is, therefore, imprudent to carry much sail, especially as Cape San Isidro is approached. The quarter-boats, studding-sails, and all light gear should be kept secure as for sea, because the wind for the moment blows with the fury of a hurricane. These squalls are known to sailors as *Williwaws*.

St. Mary Point, 12½ miles southward of Sandy Point, may be known by the land suddenly trending into *Freshwater Bay*. As the bay opens, the bluff point at its southern extremity becomes visible. There is also a remarkable round hill a short distance westward of the bay, and a valley southward of it, through which a small river falls into the sea. This bay (the Bahia de Romay of the Spaniards) is now an off station of the Chilian settlement at Sandy Point. In 1878 there were 62 people settled here, principally Swiss, from whom supplies of vegetables can be obtained between November and April, and beef at all times. Wood, of good quality, and water are plentiful. The holding ground in this bay is good, but between such anchorages as Sandy Point and Port Famine it is not likely to be required.

Between Freshwater Bay and Santa Anna Point the coast is bold, and too steep for any anchorage except in the small bight formed by the reef extending 1½ mile south-easterly from Rocky Point, known as *Port Rocky* or *Carrera*, and even this cannot be recommended. Santa Anna Point extends far into

the strait, and will be distinguished soon after passing Sandy Point by a clump of trees at its extremity. This was the cemetery for the settlement of Port Famine, and part of the railings and some vestiges of the graves are still visible. On approaching Santa Anna Point the distant cape of San Isidro will be seen beyond it, but there can be no doubt or mistake in recognizing it. Mount San Felipe is 3 miles to the northward of Santa Anna Point, and stands 1,308 ft. above the level of the sea.

Arauco Patch, with 5 fathoms water on it, lies S.E. by E. ½ E., 3½ cables off the extreme of Santa Anna Point.

Tides.—It has been said that after passing Elizabeth Point the tides are of comparatively little consequence. Along the whole extent of coast, between Elizabeth Island and Cape Froward, the flood runs to the southward, and the ebb to the northward, the time of high water, on full and change, being 12^h. The strength of the tide is not great, but frequently with a southerly wind there is in the offing a set to the northward quite independent of the tide. In winter the tides occasionally rise high, and overflow a considerable portion of the low land immediately behind the beach.

PORT FAMINE, in which was the site of San Felipe, the old Spanish colony of Sarmiento, and since then the penal settlement of the Chilian Government, now removed to Sandy Point, is an excellent anchorage on the South side of Santa Anna Point. Landing may almost always be effected (except in easterly gales) on one side or the other of the port. The River Sedger, which flows into the South part of the port, is fronted by a bar that dries at low water, but can be entered by boats at half tide, and is navigable for 3 or 4 miles. The water is fresh at half a mile above the entrance, but is not recommended. It is very good for present use, but on account of the amount of vegetable matter contained in it does not keep well. There is firewood in abundance on the beaches, and wells containing excellent fresh water, which keeps well, were dug by the *Adventure* at the N.W. extremity of the clear part of Santa Anna Point, on the bank above the third or westernmost small shingle bay.

To enter Port Famine, round Santa Anna Point at a distance of 3 cables, so as to clear the Arauco Patch, and steer in towards the head of the bay for the summit of Mount San Felipe, keeping it on over the rivulet, which will be distinguished by a small break in the trees, until the mouth of the Sedger River is open, taking care not to shut in the points of its entrance, and anchor in from 9 to 7 fathoms, as convenient. A rock was reported by Admiral Mendez Nuñez when he went through the strait with the Spanish squadron in 1867; but though this was carefully searched for, nothing could be found in the position given. Spanish Rock was, however, found 3 cables off the low-water line, on the West side, bearing S.W. ½ S. from Point Santa Anna.

At night, under steam, a vessel will be able to feel her way into an anchorage after passing Santa Anna Point, by steering a N.W. by W. course,

PORT FAMINE.
Looking Northwards

PORT FAMINE.

PORT ADMIRALTY SOUND.

From Adm. Fitz Roy's Voyage of the "Beagle."

which leads straight up the middle of the port, and the anchor should be let go so soon as 14 or 15 fathoms is obtained. The ground, though best in the middle, is excellent all over the port, being stiff tenacious clay, in some places overlaid by sand.

Voces Bay, immediately to the southward of Port Famine, has anchorage in from 7 to 10 fathoms off Second River, but not so good as in Port Famine.

Cape San Isidro has a low but conspicuous rounded hillock, covered with trees at its extremity, and forms the termination of a ridge, the summit of which is *Mount Tarn*, the most conspicuous mountain near that part of the strait on the North side. A rocky patch, covered with kelp, stretches 2 cables off the cape, with a rock at its outer end awash at high water. Mount Tarn, when viewed from the northward, is peaked, and during the summer it has generally some patches of snow a little below its summit, but in the winter months its sides are covered with snow for two-thirds down. From abreast and to the southward of Port Famine it appears saddle-shaped. Its summit is really a sharp ridge, extending nearly a mile N.W. and S.E., with a precipitous descent on the N.E., and a steep slope on the S.W. sides. The highest part near its N.E. end is 2,602 ft. above the sea by barometric measurement.

From Cape San Isidro the coast trends S.W. by S. about 7 miles to Glasscott Point, there being in the intervening shore several small bays in which a vessel may find anchorage. *Eagle Bay* is a recess of three-quarters of a mile on the South side of Cape San Isidro, with anchorage at its head in from 10 to 12 fathoms, but it is useful only for a small vessel, steadied by warps to the shore.

Gun Bay, the next to the south-westward, although small, affords anchorage for a single vessel near the shore at its S.W. part, in from 8 to 9 fathoms. Two rivulets discharge themselves into it, from which water is easily procured. The bottom is a stiff clay. A round hill, of moderate elevation and thickly wooded, separates it from *Indian Bay*, the points of which bear S.W. and N.E., and are more than $1\frac{1}{2}$ mile apart. Neither Gun nor Indian Bays are noticed in Cordova's description of the strait, although they are quite as good as any in the neighbourhood for stopping places. *Bouchage Bay* is small, and the water very deep, except near the head of the bay, where anchorage may be obtained in 8 fathoms, clay. It is separated from Bournand Bay by *Cape Remarquable*, which has a precipitous round-topped bluff projection, wooded to the summit. *Bournand Bay* is more convenient than its northern neighbour, being somewhat sheltered from the southerly winds by Nassau Island, and there being a rivulet of good water at the S.W. end of the stony beach, off which there is good anchorage in 8 fathoms, stiff mud.

Bougainville Bay, called *Jack Harbour* by the sealers, forms a basin almost as snug as a wet dock, in which a vessel might careen with perfect safety. From its small size, great depth of water, and equal height of the land, it is

rather difficult of access, but a vessel may anchor in 12 fathoms, and steady herself by warps to the trees along the sides of the cove. *Nassau Island*, half a mile S.S.E. from Bougainville Cove, will be known by its terminating in a point of needle-shaped rocks. It is covered with trees, evidently of young growth. Nassau Channel, between the island and the main, is narrow, and much affected by the tides; the least water is 7 fathoms, over stiff clay bottom.

San Nicolas Bay, so called by Cordova in 1788, was the Baye Françoise of De Gennes, on his voyage through in 1696. It is not only of larger size than any of the bays South of San Isidro, but affords the best anchorage between that point and Cape Froward, both from its being more easily entered and quitted, and from its moderate depth of water and extent of anchorage ground. It is also well sheltered from the prevalent winds between North and S.W. A large vessel going westward will do well to stop here, unless there be a probability of reaching Fortescue Bay, 38 miles farther on, before dark.

Nearly in the centre of the bay stands *Sanchez Island*, a small islet covered with trees, between which and the shore there is a passage. The shore is fronted for its whole length by a shoal bank, stretching off to a distance of a quarter of a mile from the shore; its edge is steep-to, and is generally distinguished by a ripple, which, with a moderate breeze, begins to break at half tide. At the head of the bay is *De Gennes River*, not a good place for procuring water, on account of vegetable matter.

In selecting an anchorage care is necessary not to run in too far and fall upon the bank; but unless the S.W. side of the bay is hugged very close, and as long as the outer extreme of Sanchez Island is not brought to the eastward of N.E. by E., a vessel will be quite safe.

It is high water, on full and change, in San Nicolas Bay, at $0^h\ 50^m$; springs rise 6 ft.

Glasscott Point, the southern boundary of San Nicolas Bay, is the extreme of a high range of hills, extending back for some distance; on its summit are several sharp points, Nicolas Peak being the most conspicuous. From Glasscott Point the coast trends nearly in a straight line to Cape Froward, a distance of 7 miles, the land at the back continuing mountainous and woody.

CAPE FROWARD, the southern extremity of the continent of South America, is in lat. 53° 54′ S., long. 71° 18′ W. It rises abruptly 1,200 ft. above the sea, and at its base stands a small rock, on which Bougainville landed, as did also Lieut. Graves, for the purpose of obtaining angles and bearings. The hill which rises immediately above the cape was called by Sarmiento the Moro de San Aguedo.

It is high water, on full and change, at 1^h; the ebb tide sets to the northward, and the flood to the southward, but not with much strength. With strong westerly gales there is much difficulty in rounding Cape Froward from the eastward; the best time is about sunset.

At Cape Froward, as a rule, the weather changes as suddenly as the scenery,

for though at times one may come to the westward with clear, fine weather, it is by no means usual. No better description can be given of the usual weather off this cape than that of Cordova in his last voyage. He passed in December, 1788 (midsummer, be it remembered), and says they weighed from Cape San Isidro at 3 a.m. with a light N.E. wind, which was gradually freshening, "but within a mile South of Cape Forward (Froward) it fell suddenly calm, and we began to experience a succession of terrific squalls, which commenced without any notice, and calms of very short duration; some gusts were from North, some from N.W., and others from N.N.W., and their violence was such that it would have been dangerous to a vessel not well built, and even to her if her masts and yards were not very good."

The years that have passed since this was written have wrought no change in this respect on Cape Froward. Generally, however, there is a lull towards sunset, and therefore a vessel met by strong West winds in the daytime should get into San Nicolas Bay or in Cape San Isidro. Try to pass Cape Froward in the evening, and if not desirous of going on, get to Woods or Fortescue Bay that night.

After passing Cape Froward, which is nearly in the centre of Magalhaens Strait, the channel trends to the N.W., and the northern shore should be kept aboard at least until Cape Gallant is passed.

Having now reached the middle of Magalhaens Strait, before passing Cape Froward, round which it suddenly turns to the N.W., we will cross over and describe the inner shores of the main island of Tierra del Fuego, including Dawson Island and Gabriel Channel.

Useless Bay, to the eastward of Cape Boqueron, was examined, in the hope of its communicating with the supposed San Sebastian Channel of the old charts; but it proved to be terminated by low land, reaching, perhaps, across the country towards Cape Espiritu Santo.

DAWSON ISLAND, which fronts both Useless Bay and the deep inlet called Admiralty Sound, is 45 miles long, and about 20 miles broad. Cape Valentyn, its northern extremity, is low, with a small hummock on it. *Mount Graves*, 12 miles to the southward, is 1,498 ft. in height. There are but two places in which vessels can anchor, viz., Lomas Bay, about 17 miles to the southward of Cape Valentyn, and Port San Antonio, but both being on a lee shore, they are not to be recommended. *Lomas Bay*, although only tolerably sheltered from the prevailing winds, would, from its extent (6 miles), and from the nature of the bottom, a stiff blue clay, afford good shelter for vessels of any draught. Wood is sufficiently plentiful, and water abundant.

Port San Antonio was so called by Cordova. It is scarcely a third of a mile across, and deserves the name only of a cove. It is unfit for any vessel to enter especially as there are so many better places on the opposite shore.

The port is formed by the channel between Dawson Island and the two

adjacent islands North and San Juan. *Port Valdez*, to the S.E., is a deep inlet fronting W.N.W., and not at all inviting to enter. From the appearance of the hills, which on both sides of this port rise to an elevation of from 2,500 to 3,000 ft., squalls must be very frequent.

Gabriel Channel, separating Dawson Island from Tierra del Fuego, is merely a ravine of slate formation. It extends precisely in the direction of the strata, with almost parallel shores, 25 miles in length, and from half a mile to 1½ mile wide. The northern shore is a ridge of slate, rising abruptly to a sharp edge, and then as abruptly descending on the opposite side, where it forms a valley, which, had it been a little deeper, would have been filled by water, and have become another channel like the Gabriel.

MOUNT SARMIENTO.—The South side of Gabriel Channel is formed by a high mass of mountains, probably the most elevated land in Tierra del Fuego. Among its many high peaks are two more conspicuous than the rest, Mount Sarmiento and Mount Buckland. The first, situated at the S.E. angle of Magdalen Sound, is 6,800 ft. high, and rising from a broad base terminates in two peaked summits, bearing from each other N.E. and S.W., and about a quarter of a mile asunder. From the northward they appear very much like the crater of a volcano; but, when viewed from the westward, the two peaks are in line, and the volcanic resemblance ceases. It is noticed by Sarmiento as well as by Cordova, in the journals of their respective voyages.

Mount Sarmiento is the most remarkable mountain in Magalhaens Strait; but, from the climate, and its being clothed with perpetual snow, it is almost always enveloped in condensed vapour. During a low temperature, however, particularly with a N.E. or S.E. wind, when the sky is often cloudless, it is exposed to view, and presents a magnificent appearance. From its great height and situation it served admirably to connect points of the survey. It was seen, and bearings of it were taken, from the following distant stations, viz., Elizabeth Island, 96 miles to the North, Port Famine, Cape Holland, Port Gallant, and Mount Skyring, at the southern entrance of Barbara Channel.

Mount Buckland, on the West shore of Fitton Harbour, is, by estimation, about 4,000 ft. high. It is a pyramidal block of slate, with a sharp-pointed apex, and covered with perpetual snow.

MOUNT SARMIENTO.

From Adm. Fitz Roy's Voyage of the "Beagle"

2. MAGDALEN SOUND AND COCKBURN AND BARBARA CHANNELS.

MAGDALEN SOUND.—The opening of Magdalen Sound was first noticed by Sarmiento. Coming from the northward it appears to be a continuation of the strait, and it is not until after passing Cape San Isidro that the true channel becomes evident. It extends in a southerly direction for 20 miles, and is bounded on either side by high and precipitous hills, particularly on the western shore. *Anxious Point*, the eastern point of entrance of the sound, is a low, narrow tongue of land, with an island off it. Opposite to it, on the Clarence Island side, there is a steep mountain, called by Sarmiento *The Vernal* (or summer-house) from a remarkable lump of rock upon its summit. Under this mountain lies *Hope Harbour*, a convenient stopping place for small vessels passing through Magdalen Sound. The entrance is narrow, with kelp across it.

Stokes Inlet lies to the southward of Hope Harbour, between the Vernal and Mount Boqueron, and at its entrance are the three Rees Islets. It is 3 miles long, with deep water all over; there is a cove on its North side, but neither so good nor so accessible as Hope Harbour. *Mount Boqueron*, the extremity of which is *Squally Point*, is a very precipitous and lofty mountain, about 3,000 ft. high, and carrying on its summit three small but remarkably conspicuous peaks.

Sholl Bay is a small bight of the coast line, 5 miles southward of Squally Point. There is a reef off it, which is pointed out by the kelp. *Keats Sound*, on the opposite shore, extends to the eastward for 6 or 8 miles, and is between 4 and 5 miles wide. In the middle of Magdalen Sound, off Ariadne Point, there is a rocky islet; and a little farther to the southward, on the western coast, a bay containing the *Labyrinth Islands*, among which small vessels may find good anchorage. *Transition Bay* is deep, but of little importance. At 4 miles farther at Cape Turn the channel narrows to 2 miles, and the shore turns suddenly to the westward.

On the eastern shore, to the southward of Keats Sound, there are no objects worth noticing, excepting Mount Sarmiento, already described, and *Pyramid Hill*, 2,500 ft. high. Magdalen Sound is here 6 miles wide, but at Cape Turn the channel narrows to 2 miles.

COCKBURN CHANNEL.—At *Cape Turn*, Magdalen Sound may be said to terminate, and Cockburn Channel, with its many spacious inlets and clusters of islands, to begin. It runs in a westerly direction for 40 miles, where it enters the Pacific between Magill and Camden Islands. In working down the channel, the South side should be preferred, as it is usually a weather shore, and seems to be better provided with coves and harbours in which vessels might find it convenient to anchor. King and Fitzroy Islands, in mid-channel, are of bold approach, as are also Kirke Rocks, more to the westward. *Warp*

Bay, at the commencement of Cockburn Channel, though small, and exposed to southerly winds, is a convenient stopping place. *Stormy Bay* is a very wild, unsheltered place, unfit for any vessel to enter. *Park Bay*, at the entrance of Mercury Sound, is both snug and secure, with good anchorage in 12 fathoms, sand and mud; being on the lee side of the channel, it is difficult to leave. The best anchorage is said to be in a creek West of the innermost island in the bay.

Dyneley Sound extends for more than 9 miles in a W.N.W. direction into the interior of Clarence Island. On the West side of its entrance there is a group of islands, affording several anchorages. On the western shore, *Eliza Bay* offers shelter and security from north-westerly and south-westerly winds. Proceeding into this bay, steer midway between Baynes and Dyneley Islands until a large patch of kelp (having several rocks awash at low water) is seen, which should be passed at a distance of about half a cable, thence steer for an island situated on the West side of the bay, and anchor in 17 or 16 fathoms water. There are several patches of kelp in Eliza Bay, with not less than 6 fathoms water. Small vessels may anchor in either of two small inner bays, sheltered from all winds. Vessels entering the bay without local knowledge should have a boat ahead sounding. The bottom of Dyneley Sound was not examined. *Prowse Islands*, on the South shore, are very numerous, and skirt the coast for several miles. There are several anchorages among these islands; behind them the land trends in, and forms a deep sound. A vessel in want of anchorage should hoist a boat out, and wait in the offing until one answering the purpose be found.

Tides.—The flood tide sets to the southward, or to seaward in Cockburn Channel, but was not found to run with sufficient strength to benefit or impede a vessel beating through. The rise and fall is 6 or 8 ft. at spring tides.

Adelaide Passage, lying between the broken land of Clarence Island and the Magill group, is about 13 miles long, connecting the Cockburn and Barbara Channels.

BARBARA CHANNEL, separating Clarence from St. Ines Island, is about 38 miles long from Magill Islands in the Pacific, to Charles Islands in Magalhaens Strait. *Hewitt Bay* is the first on the western shore of the southern entrance of Barbara Channel; there is anchorage in 9 fathoms in its North part. *Brown Bay*, 2 miles to the northward of Hewitt Bay, is more extensive, and also affords good shelter, in a small cove at the North entrance, in 8 fathoms, sand, among some kelp. *Nort Bay*, on the same side of the channel, is tolerably secure for a small vessel, but not to be recommended. Between Hewitt and Nort Bays the channel is strewed with many rocks and shoals, some of which, although covered with kelp, only show at half tide. Much caution is therefore necessary, and all patches of kelp should be carefully avoided. The tide, to the northward of Nort Bay, which, to the southward,

was not of sufficient strength to interfere with the navigation of the channels, is so much felt here as to impede vessels turning to windward against it.

Bedford Bay, on the western side of the narrow part of Barbara Channel, is a good anchorage, with depths of 20 to 8 fathoms, good holding ground, and sheltered from the prevailing winds. At its entrance there are several patches of kelp, the easternmost of which has 4 fathoms on it. *Nutland Bay*, 5½ miles to the northward, has 8 to 15 fathoms over a sand and mud bottom. Between Bedford and Nutland Bays there are many bays and inlets which, though not here described, might be conveniently occupied. *Broderip Bay*, 3½ miles northward of Nutland Bay, has in its northern part some good coves, and a very convenient one at its eastern extremity.

Dean Harbour is another considerable inlet, trending in under the same glacier, and extending to the head of Smyth Harbour, as well as to a great distance into the interior. If of a favourable depth, it might afford good anchorage, but the *Adventure* did not enter it. *Field Bay* is too much exposed to southerly winds to be recommended as a stopping-place, unless the wind be northerly. Nutland Bay is a more convenient place to start from with a view of passing the Narrows.

Shag Narrows is the only navigable communication that exists between Barbara Channel and Magalhaens Strait, along the western side of Cayetano Island. The breadth of the opening is at least 1¾ mile, but the eastern portion is so filled with rocky islets and shoals, that the actual navigable passage at the northern end is only 100 yards across; and the widest part at the southern end, scarcely half a mile.

Tides.—In Barbara Channel the stream of flood was found by Lieutenants Skyring and Graves to set to seaward, or to the southward, as was also the case in Cockburn Channel. In the Shag Narrows, on full and change, the stream commences to set to the southward at 12^{h}. To avoid the danger of being thrown out of the Narrows, it is only necessary to keep the western shore aboard: where there are no indentations, the tide will carry a vessel along with safety. At the northern end of the Narrows, on the western side, there is a shelving ledge with only 5 fathoms water. In shooting this passage, it would be better to furl the sails and tow through, for if the wind be strong, the varying and violent squalls would be very inconvenient.

If anchorage be desirable, on leaving the Narrows, there is none to be recommended, until the coves between Smyth Harbour and Cape Edgeworth be reached. Of these *Dighton Bay* is the best; the anchorage is off the sandy beach in 20 fathoms. *Warrington Cove*, the next to the northward, offers also good shelter and anchorage, but both are exposed to easterly winds. *Edgeworth Shoal*, lying half a mile S.E. of Cape Edgeworth, is so thickly covered with kelp as to be easily seen when approaching it; there is not more than 2 feet water over its shoalest part.

Smyth Harbour, the first opening after passing the Narrows, is surrounded

by high land. The water is deep, except in *Earl Cove*, on the North side, where vessels might lie, if necessary; but it would probably be a very wild place in bad weather.

3.—THE STRAIT OF MAGALHAENS FROM CAPE FROWARD TO THE PACIFIC OCEAN.

FROWARD REACH.—Snug Bay, 5 miles West of Cape Froward (page 26), is merely a slight hollow in the coast at the outfall of a small rivulet, the deposits of which have thrown up a bank near the shore, on which anchorage may be had in 8 or 9 fathoms. In fine weather a vessel might hold on here, if absolutely necessary, and the best anchorage is about half a mile E.S.E. of the island in 9 fathoms, sand.

Cape Holland, 13 miles westward of Cape Froward, is a conspicuous headland; it is precipitous, and descends to the sea in steps plentifully covered with small trees and shrubs. There is a strong tide off the cape, and it should not be closed too much in passing. There is sheltered anchorage from northwesterly winds, 3 or 4 cables off it, with the extreme bearing about West. *Woods Bay*, the bay D'Oliver, of Oliver Van Noort in 1599, and the Bahia de Solano of the Spaniards, is under the lee of Cape Holland, and is a convenient stopping place for ships. Small vessels may enter the cove by skirting and luffing round the edge of the kelp, which extends about a cable's length off the extreme of the cape, and in which there is a rock with only 4 ft. of water upon it. The best anchorage for a large ship is that mentioned above, with the cape bearing West.

If it be decided to go inside, steer for the gap or low land behind the cape, and as the South point is neared, keep midway between it and the river's mouth; or keep a hillock, with a conspicuous clump of trees on it, at the inner end of the bay, in line with a remarkable peak, 1 or 2 miles behind, bearing N.W., and anchor in 17 or 18 fathoms. The bank on the N.E. side shoals suddenly, and must be avoided.

Near Cape Coventry and Andrews Bay the anchor may be dropped in fine weather, but there is no shelter to the westward of the former; about half a mile off 13 fathoms will be found. It is high water, on full and change, in Woods Bay, at $0^h\ 34^m$; springs rise 8 ft.

Cordes Bay, 12 miles westward of Woods Bay, may be known by a small, bright green islet, called *Mussel Island*, which lies in the entrance, and also by a hill to the northward, with three hummocks about 1,357 ft. high, called *Mount Three Peaks*, and standing detached from the surrounding hills at the head of the bay. The western entrance between the West point and the reef off Mussel Island is two-thirds of a mile wide; from it the bay continues a mile

wide, but is much contracted by shoals covered with kelp; between them, however, the anchorage is good and well sheltered, the bottom being of sand, and the depth from 5 to 7 fathoms.

FORTESCUE BAY was called by the Spanish voyagers *Bahia de Fuerte Escudo* (good shelter); but whether its present name is an English corruption of this, as seems probable, or whether it was called after some one named Fortescue, does not appear. It is the first really good anchorage westward of San Nicolas Bay, and one of the best in the whole length of the strait. It is spacious, well sheltered, easy of access, and of moderate depth. It is not recommended to anchor very close under the island on the West side, where the williwaws are more uncertain in their direction. The holding ground also is not so good as in the eastern part of the bay; the best berth is from South to S.E. of Cross Island, in from 4½ to 8 or 9 fathoms, according to the distance from shore.

In entering Fortescue Bay from the westward a good berth should be given to Cape Gallant, as the flood during the springs sets strongly towards the cape, and the same precaution is necessary on leaving it again on the ebb in rounding Petrel Point if bound to the eastward, for the ebb sets directly towards and around it.

PORT GALLANT, forming the inner harbour of Fortescue Bay, was probably named from Hugh Gallant, one of Cavendish's men who died and was buried there, though the *Hugh Gallant* was also the name of one of Cavendish's ships. When inside, it forms a snug little port, perfectly sheltered, and with excellent anchorage, in 3 to 3½ fathoms, mud. The entrance, however, is narrow, and has filled up considerably since the days of the *Adventure* and *Beagle*. There is only 2½ fathoms in the channel at low water, and as Fortescue Bay is quite sufficiently sheltered, and much more easy to reach or quit, there seems to be no object for going inside unless repairs have to be done. The banks on the western side, off the East shore of Wigwam Island, are not well defined, and a vessel is likely to ground on them.

Caution is required with respect to the natives, who have shown themselves hostile on several occasions, as mentioned on page 3.

Tides.—It is high water, on full and change, at Port Gallant, at $0^h\ 34^m$; springs rise 8 ft. In this part of the strait, as the channel becomes narrowed by the islands, the tides are more felt, and run as much as 3 miles an hour. We have, however, the authority of Cordova's Lieutenant, Churruca, who pulled all along this part of the strait, for saying that close in shore the tide runs the contrary way to that in mid-channel.

CLARENCE ISLAND, on the South side of Froward Reach, extends from Magdalen Sound to Barbara Channel; and the whole length of its northern coast is indented by sounds stretching deeply into the island. *Port Beaubasin*, at the West side of entrance of Magdalen Sound, is sufficiently pointed out by the

small rocky islet called Periagua, and by Mount Vernal (page 29). It is a very snug place when once in, but possesses no advantage, since it is on the wrong side of the strait for vessels bound to the westward, as the northerly wind, which would be favourable to proceed, would prevent a vessel sailing out. *Inman Bay*, *Hawkins Bay*, *Staples Inlet*, and *Port Sholl*, are all deep inlets, surrounded by high precipitous land. *Lyell Sound* penetrates 9 miles into Clarence Island to the westward of Greenough Peninsula, and is separated from Sholl Harbour by a ridge of hills only 1½ mile wide. In the entrance of the sound are the two conspicuous islands *Dos Hermanas* (Two Sisters), which bear from Cape Froward S.S.W., 5½ miles. *Mazaredo Bay* and *Cascade Harbour* are of less size, and therefore more attainable, but of the same character with Lyell Sound, viz., deep water surrounded by high land. The former is known by the cascade which M. de Bougainville describes, from which it derives its name. On the headland that separates these harbours from Lyell Sound there is a sugarloaf hill, the position of which was well determined to be 53° 57′ S., and 71° 27′ W. *Hidden Harbour*, at 1½ mile westward of Cascade Harbour, has a narrow entrance: but, if required, offers a good shelter.

San Pedro Sound is the most extensive inlet with which we are acquainted in Clarence Island. It extends in a southerly direction for nearly 13 miles, and has three other inlets branching off into the land, two to the westward, and one to the eastward. There is a good, although a small, anchorage on its western side, 1½ mile within the entrance, called *Murray Cove*, and another close to it, which is even more sheltered. *Freshwater Cove*, at 4 miles westward of San Pedro Sound, is a confined and indifferent place. *Bell Bay* has one very convenient anchorage, in 17 fathoms, in Bradley Cove, on its western side, bearing S.W. ¾ W. from Taylor Point, the eastern head of the entrance to the bay. *Pond Bay*, to the northward, has good shelter. *Mount Pond*, a double-peaked hill over the harbour, 2,500 ft. in height, is conspicuous. It has two summits, one of which is only visible from the eastward.

Simon Bay, between Cape Inglefield and Elvira Point, is studded with islands and rocks. To the southward it communicates with Barbara Channel, but from the irregularity and force of the tides, Shag Narrows, described on page 31, is to be preferred. *Millar Cove*, on the East side of Cayetano Island, is the only good anchorage in Simon Bay. It is about 3 miles southward of Elvira Point, and has three rocky islets off its entrance. In *Port Langara*, southward of Millar Cove, the water is deep, excepting at the head of the port and in a cove on its northern shore, in either of which there is good anchorage; at the former the depth is 8 fathoms, and in the cove 5 fathoms.

Barbara Channel has been before described on page 30.

ENGLISH REACH may be said to commence between Cape Gallant and Charles Islands, and to extend thence 27 miles to the westward to abreast the entrance of Jerome Channel. We first describe the northern shore of the channel, and then the southern.

Passage Point is 8 miles westward of Cape Gallant, and at a short distance W.S.W. of it is a shoal with 2 fathoms on it, but it is always well marked by kelp. *Elizabeth Bay*, just northward of Passage Point, has a sandy beach and a rivulet flowing into it. There is fair anchorage in this bay about half a mile from the eastern beach, in 13 to 16 fathoms, sand. A rocky ridge extends off from a low point West of the anchorage. It is quite covered at high water, and extends about a cable off shore. The tide is not strong in the eastern part of Elizabeth Bay; but it is so in the western part, where there is an indifferent anchorage in 14 or 15 fathoms near the edge of the kelp, about 250 yards from the beach.

York Road or *Batchelor Bay* (Rada de Vacaro of the Spaniards) is at the entrance of Jerome Channel. Capt. FitzRoy describes it as a good and convenient anchorage; but as the tides set strongly through both Crooked Reach and Jerome Channel, a vessel lying here in light winds will be sheared about most uncomfortably. *Batchelor River* is accessible to boats only.

A rock awash, marked by kelp, was found lying on the South side of York Road, about 1 cable from the shore, with the right extreme of York Point bearing S. 58° E.; Little Bonet Island, S. 49° W.; and Batchelor River entrance, N. 31° W. No indication was found of the rock reported to lie about 3 cables from the shore in York Road, between English and Crooked Reaches.

Anson Rock, which is very small in extent, has 18 ft. water over it, about 6 cables from the northern shore, with deep water around, and is marked by kelp; from it the S.E. extreme of St. Jerome Point bears N. 28° E.; Merrill Point, Tilly Bay, S. 42° E.; and the West extreme of Cape Crosstide, S. 10° W. The South extreme of Borja Island, in line with the notch between the two summits of Cape Quod, W. by S., leads southward of Anson Rock. No indication of shoal ground was observed near the assigned position of the 3-fathoms rock, reported in 1881, as lying about 5 cables south-eastward of St. Jerome Point.—*Capt. Wharton*, H.M.S. *Sylvia*, 1882.

The tides in this part of the strait are uncertain, on account of the meeting of the waters of Jerome Channel with those of the strait through English and Crooked Reaches, which occasions many ripplings, and would require lengthened investigation to understand correctly.

Charles Islands, between Fortescue Bay and Barbara Channel, consist of three principal and some smaller islets. Opposite to Cape Gallant, on the eastern island of this group, and near its N.W. end, there is a conspicuous white rock, called Wallis Mark. *Wren Island*, the south-eastern of the group, is a small rocky islet, rising abruptly in two peaks.

Choiseul Bay, to the W. by S. of Charles Islands, does not seem to be in the least inviting. *Nash Bay*, 4 miles to the westward, is equally unserviceable. *Whale Sound*, South of Ulloa Peninsula, has anchorage only in one part of it, and is so far out of the way as to be of no practical use to the navigator.

Carlos III. Island, so named by Cordova, is joined to Rupert Island by a

reef called Lucky Ledge. It is high, and covered with small trees. To the northward of Whale Point, the south-eastern extremity of Carlos III. Island, there is a cove with an anchorage in 15 fathoms close to the shore, on a steep bank, but bad ground. *Mussel Bay*, to the westward of Cape Middleton or Narborough, on the North shore of Carlos III. Island, is of considerable size, and well sheltered, but the bottom is uneven and stony, and the water deep. *Tilly Bay*, though small, has a good and safe anchorage a short mile eastward of Cape Crosstide, the N.W. end of Carlos III. Island. A large ship must anchor in the middle, or a little farther in, where she will get 18 to 20 fathoms, mud. Anchorage in less water may be had nearer the shore on the North side, but the bottom seems more rocky there.

David Sound separates Carlos III. Island from the Ulloa Peninsula. At its northern extreme the water is deep, but where it begins to narrow there are soundings, and possibly an anchorage. In a passage like this, however, between high land the squalls would be so violent as to render anchorage very unsafe.

Jerome Channel leads to two extensive sheets of water, known as *Otway Water* and *Skyring Water*, connected by *Fitzroy Channel*, which is very narrow and much obstructed. At *Las Minas*, on the North shore of Skyring Water, are some coal mines, but from a practical trial made of the coal by H.M.S. *Alert*, in 1880, it proved to be of very inferior quality. For an interesting account of the visit of H.M.S. *Alert* to Skyring Water, see the "Proceedings of the Royal Geographical Society," Sept. 1880, p. 552.

CROOKED REACH.—Passing by Jerome Channel, as practically useless to the navigator, we round Cape Crosstide, and enter Crooked Reach, the only good anchorage in which is Borja Bay. *Cape Quod*, or *Queade*, as the Spaniards spelt it, is a projecting point, 600 ft. high, on the northern shore of Crooked Reach, and has a very bleak, rugged appearance, being very easily recognised in coming from the eastward. The almost perpetual westerly wind seems to forbid all vegetation on the heights exposed to its action, and accounts for the desolate look of these shores.

Borja Bay (Island Bay of Buron) is on the northern shore of Crooked Reach, 2 miles eastward of Cape Quod ; its position is pointed out by the Ortiz Isles and Big and Little Borja Islands, which lie off its West point, as well as by its situation with respect to El Morion. The entrance is to the eastward of the larger of the Borja Islets, and presents no dangers. The shores of the bay may be approached to half a cable's length, close to the edge of the kelp. This bay fully deserves the praise given to it by Captains Stokes and FitzRoy, and for a steam vessel is perfectly easy of ingress and egress. Here, as everywhere in the western part of the strait, the williwaws are at times very heavy, but they need not be feared as there is no sea, and the holding ground is excellent. A large ship should anchor well out in about 20 fathoms, but a smaller one can

go into 12 or 13 fathoms. It is better not to moor unless the size of the ship makes it absolutely necessary.

The anchorage in the bay is sheltered from the westerly and south-westerly gales which usually prevail. As the holding ground is good, the depth of water moderate, and any stretch of sea prevented by the narrowness of the adjacent strait, it is a very good and secure anchorage. No surf or swell obstructs the landing anywhere, and there is plenty of wood and water. A number of boards with ships' names upon them will be seen on the eastern side of the bay near a rivulet, and these form a good mark for picking up an anchorage by not bringing them eastward of N.E. by E.

Crooked Rock, lying about three-quarters of a mile S.W. by W. from the North end of Little Borja Island, has 3 ft. of water on it, 3 fathoms close to its sides, then 10, 20, and 40 fathoms. It is marked by kelp, but vessels running during the night, or by day in fogs or snow storms, should keep well over on the southern shore, where no known danger exists. The summits of Big and Little Borja Islands in line, N.E. ½ N., lead about 2 cables S.E. of it.

Tides.—It is high water, on full and change, in Borja Bay, at $1^h\ 30^m$; springs rise 6 feet.

On the southern shore of Crooked Reach is a lofty granitic rock, *El Morion* (the Helmet), of which the outer face is perpendicular, bare, and of a light clay colour, distinguishable from a considerable distance, both from the eastward and westward, and forming an excellent leading mark to assure the navigator of his position. El Morion is remarkable also for a large white patch on its face.

In the investigation of this part, Wallis and Carteret suffered extreme anxiety, and anyone who has read their journal would not willingly run the risk of anchoring in any port or bay on the southern shore of the strait.

Snow Sound is a deep inlet on the South shore of Crooked Reach, unimportant to the navigator, and not worth the trouble of entering.

LONG REACH begins at Cape Quod (page 36), and extends to the entrance of the Gulf of Xaultegua, a distance of 36 miles in the direction of W. by N. ¼ N. The weather in this reach is frequently so thick, that, although the distance across it is only 2 to 3 miles, one shore is found concealed from the other by the mist, on which account Captain Stokes found it impossible to form any plan of this part of the strait on his passage through it.

The navigation by a steam vessel presents little difficulty on this account. The high land is commonly obscured, as well as the points at a distance of 2 or 3 miles, but they can almost always be seen sufficiently far off to avoid running on them. Cordova seems to have been greatly impressed by the appearance of Long Reach, for he says, "As soon as Cape Quod is passed, the strait assumes a most horrible appearance, having high mountains on both sides, separated by ravines entirely destitute of trees from the mid-height upwards."

Barcelo Bay has no safe anchorage in it. *Osorno Bay* is of no service, being narrow and deep, as well as open to all westerly winds, which blow with great force down Long Reach. *Langara Bay*, the next to the westward, trends in for about a mile to the N.E., and has 10 to 12 fathoms on a stony bottom, consequently it is useless to mariners. The western point of *Posadas Bay* is formed by a high pointed precipitous headland, resembling, in Wallis's idea, a lion's head; and though Cordova could not discover the likeness, it is sufficiently descriptive to point out the bay, were the anchorage worth occupying, which it is not. *Arce Bay*, which Cordova describes as having anchorage in 6 to 17 fathoms, stones, divides at the bottom into two arms, each being half a mile long. The outer points bear from each other W.N.W. and E.S.E. half a mile apart. *Flores Bay* is probably the Good Luck Bay of Wallis. Cordova describes it as small and much exposed, with 26 fathoms, stone and gravel. *Villena Cove*, about 10 miles to the westward of Arce Bay, has from 15 to 20 fathoms, but it is open and exposed.

Guirior Bay is large, and open to the South. Cordova says it extends more than 3 miles to the northward, the mouth being more than 2 miles wide. At its western point is *Cape Notch*, which will serve to recognise it. Near the entrance there are several rocks and an island, and within them, on the western side, two coves, with 15 to 30 fathoms, stone. Farther in is the port, which has a narrow entrance, and into which a river falls from a considerable height. The rapidity of the stream has formed a channel in the direction of the entrance, and in this channel there is anchorage in 20 to 26 fathoms. The port is too difficult to reach to make its anchorage an object of great value.

A vessel proceeding into Guirior Bay from abreast Cape Notch, should keep in mid-channel, and steer northward towards a conspicuous cascade. Anchorage will be found in 24½ fathoms, mud, clay, and broken shells, about 1¾ mile within the entrance, and 1 cable distant from a shoal with 7 ft. water, marked by kelp, extending from a point on the West shore of the bay; northward of this shoal there are numerous rocks.

From the above brief description of the bays between Capes Quod and Notch, occupying a space of 9¾ miles, none seem to be either convenient or safe, and the best port for shelter for a ship in this part of the strait is Swallow Bay, on the opposite shore.

Cape Notch, a projecting point of gray-coloured rock, about 650 ft. high, having a deep cleft in its summit, is a conspicuous headland from either side, and cannot be mistaken. Captain Stokes remarks that the mountains in the neighbourhood of this cape spire up into peaks of great height, and are connected by singularly sharp saw-like ridges, as bare of vegetation as if they had been rendered so by the hand of art.

Glacier Bay, on the North side of Long Reach, is only remarkable for the very fine glacier at its head. It was examined by the *Nassau*, but found to be quite exposed to all West winds from North to South, and where the water

was sufficiently shoal to find anchorage, the space was too confined for a vessel of any size. The large bay East of Glacier was also carefully examined, and found quite exposed and very deep. Between Glacier Bay and Playa Parda Cove the shore is bold and uninterrupted, except by a small cove about 2 miles to the eastward of Playa Parda Cove, which seems to afford shelter for small craft.

Playa Parda Cove, which may be known by three white stripes, resembling roads down the side of the mountain, is the next place westward of Cape Notch that can be recommended for an anchorage. It is well sheltered, and has a good bottom, being of sandy mud, strewed with stones. The place, however, is so confined that no vessel which is too large to go into the inner cove is advised to anchor there. Commander Hare, H.M.S. *Myrmidon*, in 1877, remarks that the cove is not suitable for vessels over 150 ft. in length. H.M.S. *Sutlej* anchored in the outer anchorage in 8 fathoms, as did also the *Zealous* in March, 1867, but it is not adapted for such large ships in bad weather, as the water shoals suddenly from 30 to 15 and 11 fathoms, and if a vessel drags off the bank, she is almost certain to tail on the southern shore. This was the case with the *Sutlej*, for at 2.10 a.m. a violent squall brought a sudden jerk on the cable, and broke the anchor off near the crown, and although a second was let go instantly, her stern tailed into shallow water. The holding ground does not seem particularly good, for in her case the anchors came home in heaving the ship off. If it should be absolutely necessary for a large ship to anchor here, she should certainly moor, as did the *Zealous*, on acount of the confined space; the best way to do this is to steam in straight for the centre of Middle Point, bearing about North, let go the port anchor directly bottom is obtained, and putting the helm a starboard shoot up towards the entrance of the cove as far as the vessel's draught will let her go. The outer anchor of the *Zealous* was in 18 fathoms, and the inner in 6½ fathoms.

The inner cove is quite landlocked, and is a secure anchorage for vessels of moderate size. The South and West shores of the cove are clear, but on the East and N.E. sides the water shoals more than a cable from the shore; but if Wooding Point or the rocks awash outside the cove are kept well open of the eastern point, good anchorage will be had in 5 to 6 fathoms, mud. Nearly in mid-channel at the entrance, which is 90 yards wide, is *Svetland Rock*, with 16 feet water over it.

Capt. Willemont, of the French transport *Cher*, 1875, reports the existence of a rock with 9 ft. over it, lying about half a cable from the shore, in the passage leading to Playa Parda inner cove. Also, that the *Cher* struck her rudder against a sunken rock in the N.E. part of the inner cove.

A ship too large to go into Playa Parda Cove will do better to go on to Port Angosto than to anchor in the outer anchorage. Playa Parda Cove may be known by Shelter Island, which fronts the inlet of Playa Parda. The inlet is 1½ mile long and half a mile broad, with deep water all over it. By luffing

round the island the ship will fetch the outer anchorage, and although sail should not be reduced too soon, yet the squalls, if the weather be bad, blow down the inlet with great violence, and care must be taken not to have too much sail. There is a small kelp patch about midway between Shelter Island and the main, and a large one about 2 cables off the N.W. point of the island. Between Playa Parda Cove and Havana Point there is no anchorage on the North shore for a large ship. It is high water, on full and change, in Playa Parda Cove, at $1^h\ 8^m$.

Marion Cove is well sheltered from all winds except between S.S.E. and S.S.W. A small vessel might anchor there in 30 fathoms in the centre of the cove, with her stern fast to the shore, but there is no room to swing. *Pollard Cove* is much like Marion Cove, and in fine weather the anchor might be dropped in 18 or 19 fathoms, near the head of the cove, but there is no room to veer cable or swing. *Hannant Bay* is quite exposed, and has no anchorage in it.

Gulf of Xaultegua.—The plan that was made of this gulf is little more than an eye sketch. Capt. FitzRoy, who examined it, says :—"The gulf is utterly useless, as from the appearance of its shores there seems to be no anchorage. Should a ship be so unfortunate as to make a mistake and get into it, she must keep under weigh till she gets out again, there being no thoroughfare. No ship, however, should make such a mistake, as there is no danger in keeping the South shore aboard in that part of the strait."

The triangle of land intervening between Magalhaens Strait, the Gulf of Xaultegua, and Jerome Channel, is named Cordova Peninsula, as that navigator explored and described most of the small bays along its south-western face.

On the *Southern Shore* of Long Reach is *Swallow Bay*, the Bahia Veronesa of the Spaniards, $1\frac{1}{4}$ mile westward of Snow Sound (page 37), and by far the best anchorage in Long Reach, indeed the only one fit for a very large ship. All dangers are well buoyed by the kelp. On the West side of the entrance is *FitzRoy Rock*, about a cable's length off Carteret Island; it is stated to cover some time before high water, and is marked by kelp, but between this and the Wallis Islets the passage is perfectly clear. After entering, the Fisgard Rocks will be seen 2 cables inside Duntze Point, and nearly in the middle of the bay; these are well marked by kelp, and may be passed on either side, the big ship anchorage being about $1\frac{1}{2}$ cable inside them.

A smaller vessel will find anchorage farther up the bay. The *Nassau* rode out a heavy gale here at single anchor without starting, though the cable was sometimes heard to grind over the points of rock which project up through the mud. Swallow Bay may be easily recognised by a large cascade falling down from the centre of the mountains at the bottom of the port. *Condesa Bay* is full of islets and rocks, and has not nearly so much room in it as Swallow Bay. *Stewart Bay* (Bahia de Stuardo) follows Condesa Bay. It is not to be recom-

mended as an anchorage; for though sufficiently sheltered from wind and sea, yet the rocks in different parts of it render the passage in and out very hazardous. The *Nassau* steamed into the entrance, but backed out again on observing the kelp, as it seemed joined right across, and it was blowing too hard to lower a boat. *Snowy Channel*, of Sarmiento, next follows, and all that is known of it is that it extends to the southward for 5 or 6 miles, and probably terminates like Snow Sound. To the westward of Snowy Channel there are several inlets, but they were all found to have too deep water for anchorage.

Abra (of Sarmiento), on the southern shore of the reach, opposite Playa Parda, is the Magalhaens Strait entrance to Sea Shell Channel, leading to Dynevor Sound. The Abra (opening) has no place worth anything as an anchorage in it. Between the Abra and Port Angosto there is no place fit for an anchorage, although there are several inlets which look inviting; the *Nassau* steamed round them all without being able to find an anchorage, except so close to the shore as to render it valueless. *Rocky Inlet*, the next to the Abra, has two islands in its entrance, and is very deep all over.

Port Angosto, about 11 miles to the westward of the Abra, affords good anchorage, with room enough for a large ship, but for a small vessel it is not so comfortable as the cove of Playa Parda, for, being larger and the land lower, the williwaws are felt much more. The holding ground is of stiff mud, however, and the *Nassau* rode out a heavy gale with furious squalls there at single anchor. Going westward, a good mark for this port is a conical mountain (Mount Possession of Sarmiento), which rises over its entrance on the East side about 1,000 ft. high, and down the face of which a large waterfall discharges into a bay just outside the port. About 3 miles from it a group of islets are passed, which lie off the entrance of a wide-mouthed inlet. A mid-channel course is the best up the inlet, and as Passage Islet is passed, the larger waterfall will be seen over Hoy Point, and the port itself will open. The best anchorage is nearly in the centre, in 13 or 14 fathoms, rather on the S.W. shore than otherwise. On entering such a completely landlocked place, care should be taken not to let go the anchor too soon, as the ship will lie stern out with prevalent winds. This remark applies to most of the ports in the western part of the strait, where the surrounding land is high.

Half Port Bay is merely a slight indentation of the coast, immediately West of Port Angosto. A depth of 16 fathoms was found about half a cable from the western point, off which the *Beagle* anchored, but the indentation is not deep and wide enough to shelter a ship of any length. *Canoe Inlet*, immediately West of Half Port Bay, has no convenient anchorage. The same remark may be applied to all the inlets except Port Angosto, between Snow Sound and Cordova Channel, as well as to most of those in the western part of the strait, and in the channels leading northward. In the western strait alone, fifty-two bays and inlets were examined by the *Nassau;* all were perfectly sheltered,

and as a rule free from danger of any kind, but so deep as to render them quite useless as anchorages.

Tides.—Little has been said of the tides in this part of the strait, for they rise and fall only 4 ft. It is high water, on full and change, in all parts within a few minutes of noon. The ebb tide has little or no strength. The current sets constantly to the eastward; between Capes Notch and Quod it set the *Adventure* 2 miles to the eastward in 3½ hours; and from Cape Quod to Port Gallant it carried her 6 miles in 3½ hours.

At Cape Monday, about 3 miles north-westward of Port Angosto, there is anchorage under the cape for small vessels. For large vessels there is no good anchorage between Port Angosto and Port Churruca, and a vessel not having time to reach Port Churruca or Port Tamar should not pass Angosto unless intending to keep under weigh all night. *Medal Bay*, 1½ mile westward of Cape Monday, has no shelter whatever. Both entrances of *Cordova Channel* were examined for anchorage, but without success.

SEA REACH, forming the western entrance to Magalhaens Strait, runs W. by N. and E. by S. for 52 miles. On the northern shore, between Capes Tamar and Phillip, it opens into the channel which leads into the Gulf of Peñas, inside Queen Adelaide Archipelago. Hitherto, in passing through Magalhaens Strait from Elizabeth Island, through Famine, Froward, English, Crooked, and Long Reaches, to its western end, there is very little swell. In a heavy gale, or perhaps a strong breeze, a short sea may be experienced in the wider parts of the strait, especially westward of Cape Froward; but on opening Sea Reach a heavy swell will be experienced coming from the Pacific. An easterly set is generally experienced in Long and Sea Reaches, especially in the latter; although the shores are steep-to on both sides, there are several off-lying islets, which would render working to windward in a long ship in thick weather very dangerous.

Cape Providence, 1,230 ft. high, is a rugged mountain on the North shore of Sea Reach. It is higher than the adjacent coast, deeply cleft at the top, and from a bearing of about North, the western portion of its summit appears arched, and the eastern peaked and lower. When the cape bears about E. by S., 4 or 5 miles, a little round rocky islet will be seen open to the southward. H.M.S. *Charybdis* found good shelter from northerly winds under Cape Providence in 20 fathoms, rocky bottom, in May, 1871.

Round Island, between Capes Providence and Tamar, is easily distinguished from the others near it, and is a very good mark for ascertaining a ship's position all along that part of the reach. There is said to be a well-sheltered anchorage, but with deep water, in a bay to the N.W. of Round Island, but with Port Tamar so near, it would be of little value.

Astrée Rock, on which the French frigate *Astrée* struck on her passage to Valparaiso, in October, 1868, was examined by H.M.S. *Albatross*, in 1874. It was found to have a depth of 14 ft. water, on which the sea breaks occa-

sionally. From it Round Island is shut in by Cape Tamar, the latter bearing E. by N. $\frac{3}{4}$ N.; and the West extreme of Tamar Island bears N. by W. $\frac{1}{2}$ W., 2 miles. Round Island kept open of Cape Tamar, or seen between Cape Tamar and Sentry Islet leads South of Astrée Rock.

Diamond Rock, which was reported in 1862 to lie 2 miles S.S.E. of Cape Tamar, was searched for during the survey by H.M.S. *Nassau* without success, and also by the *Albatross*, and other of Her Majesty's vessels, from 1874 to 1878. Don Juan E. Lopez, commanding the Chilian corvette *O'Higgins*, 1874, however, states: that he passed about 50 yards to the westward of Diamond Rock, which lies S.S.E. 2 miles (approximately) from Cape Tamar. From this position of Diamond Rock, the West extremity of Tamar Island would bear N.W. $\frac{1}{4}$ W. The rock was seen at low water equinoctial springs, and appeared to be about 16 ft. in diameter, about 2 ft. high, and skirted by seaweed. Until the position of Diamond Rock shall have been confirmed, ships entering or leaving Port Tamar should be on their guard when nearing its reported position. It has been expunged from the British Admiralty charts.

Cape Tamar, 9$\frac{1}{2}$ miles westward of Cape Providence, is smooth and round, apparently about two-thirds the height of Tamar Island, and coming from the westward the cape shows as an extreme of land on the North side immediately after the strait is entered. From the eastward the extreme of Tamar Island will show outside the cape when bearing to the northward of N.W. by W. $\frac{3}{4}$ W.

PORT TAMAR, an excellent anchorage on the eastern side of Cape Tamar, is about a mile wide at the entrance, and half a mile deep. Approaching Port Tamar from the eastward, care must be taken not to close the land too far East of the port, on account of Percival Reef; as, however, this and all other dangers are buoyed by kelp, there is no real difficulty to be apprehended. If it be not blowing hard, it would perhaps be better to enter to the westward of Dolphin Island; but in strong westerly winds it would be better for a steam-vessel to pass under the lee of the island, and enter the port between it and Byron Point.

There is a remarkable white patch about one-third the way up the green side of the mountainous land forming the coast of the bay, and by keeping this on the line of W. $\frac{1}{4}$ S. until the beach on the East side of the bay opens, it will lead clear of all danger and into a very good anchorage. The *Beagle* is reported to have struck on a sunken rock with only 9 ft. water, bearing E. by S. $\frac{1}{4}$ S. from the white patch above mentioned; but it could not be found in the *Nassau*. The best anchorage is between Spencer Island and John Point, in about 15 fathoms; here the *Nassau* and *Ringdove* rode out a very heavy gale together in perfect safety.

Tides.—It is high water, on full and change, in this part of the strait, at $1^h\ 40^m$; the rise and fall in Port Tamar is 6 ft., and a little less in Port Churruca. The flood tide in this part of the northern shores of the strait sets to the eastward, and rarely exceeds half a knot.

Tamar Island, lying off the West side of Cape Tamar, has two peaks that can be seen in clear weather from Cape Pillar; the northern, Jones Peak, is 1,380 ft. high, and the southern 1,250 ft. high. There are several rocks off its S.W. end.

Between Capes Tamar and Phillip, a space of 12 miles, there is a deep bight with two openings, the easternmost of which, containing *Glacier* and *Icy Sounds*, extends to the N.E. for 10 miles from the mouth, and the westernmost is the commencement of *Smyth Channel*, described hereafter.

Sholl Bay is under the N.E. side of Cape Phillip, the western point of entrance to Smyth Channel. Of this place Captain Stokes says: "We found here excellent anchorage in 15 fathoms. It is valuable for vessels working through the strait to the westward, inasmuch as this place will be much more easily recognised than the anchorage on the opposite coast; besides which the winds hang here in general somewhat to the northward of West, hence a better starting place for the westward is obtained. Here, as in every anchorage in the strait, water and fuel are easily procured, but nothing more, except some berries, celery, mussels, and limpets.

"The kelp goose, which is never edible, abounds here. It is the only one found in the western strait or northern channels. We always met Indians here, and they seemed to live pretty constantly in Deep Harbour."—*Captain R. C. Mayne, R.N., C.B.*

It is almost impossible to mistake the position of Sholl Bay, as Cape Phillip and *St. Ann's Peak*, the latter rising 1,545 ft. above the centre of the bay, are excellent marks. Although this anchorage is confined, with several rocks off it, it is secure inside, and will be found advantageous for steam-vessels going through Smyth Channel. Nearly three-quarters of a mile eastward of the South point of the bay is *Flat Rock*, 5 ft. above high water, which will not be distinguished until it is open of Cape Phillip; and as the shoal water off it extends more than a mile to the southward, care should be taken to sight the rock before closing the land too much. Northward of Flat Rock, at 4 and 6 cables distant, are two detached rocks just awash at high water, with shoal ground half a mile beyond them to the northward, and about three-quarters of a mile N.E. by E. $\frac{3}{4}$ E. of Flat Rock are two rocky heads, with $4\frac{3}{4}$ and 5 fathoms, 1 cable apart, discovered by Captain Freycinet. All these dangers are marked by kelp.

The squalls come over the land with terrific force, but the water is perfectly smooth, and the *Nassau* rode out two very heavy gales in this bay at single anchor. In an easterly gale no ship should think of going into Sholl Bay, as it is perfectly open, but should either run out of the strait before it, or stop at Port Churruca. About $1\frac{1}{2}$ mile S.E. of Freycinet Rock is a kelp patch, on which 5 fathoms was found, but its position was not accurately determined, owing to its being too thick to obtain angles, and the bearings not agreeing.

Sholl Bay on the North, and Tuesday Bay on the South, are the westernmost safe anchorages in Magalhaens Strait.

CAPE PARKER, about 10 miles westward of Cape Phillip, is a remarkable projection, with three hummocks on a ridge of high land which rises behind it. To the eastward the coast bends deeply into the North, forming Parker Bay. To the westward of it commences a range of islands, rocks, and shoals, fronting a broken coast that should never be approached but for the purpose of discovery or seal fishery. The easternmost of these islands is a rock, 1,100 ft. high, named *Westminster Hall.*

Sir John Narborough Islands consist of 8 or 9 large islands, and hundreds of small ones. Behind them there seemed to be a channel, and amongst them are several anchorages, but none to be recommended, especially as on the South coast there are two or three much better, safer, and easier of access. Their north-western point is Cape Victory, in lat. 52° 16′ S., long. 74° 55′ W., which may be considered as the N.W. point of entrance of Magalhaens Strait.

This is all a dangerous coast, as well from the great number of rocks, upon which the sea breaks very high, as from the tides, which near the edge of the line of shoals frequently set in amongst them.

LOS EVANGELISTAS, consisting of four rocky islets and some detached rocks and breakers, lie 11 miles S.W. by S. ½ S. from Cape Victory. They were thus named by the early Spanish navigators, but they were called the Islets of Direction by Narborough, from their forming an excellent mark for the western mouth of the strait. The islets are very rugged and barren, and suited only to afford a resting-place or breeding haunt for seals and oceanic birds, but a landing place may be found on one of them, and anchorage among them if necessary. The largest and highest (360 ft.) may be seen in tolerably clear weather from a vessel's deck, at a distance of 12 to 15 miles. The southernmost, from its shape called the Sugar-loaf, is in lat. 52° 24′ 30″ S., long. 75° 7′ 15″ W., and bears from the extremity of Cape Pillar N.W. by W. ½ W., 23 miles.

CAPE UPRIGHT (San Ildefonso of Cordova), on the southern shore of Sea Reach, bears S. by E. 5 miles from Cape Providence. It is about 900 ft. high, and has a rocky islet a quarter of a mile off its northern extremity. Strong tide rippling will frequently be observed off this cape.

The *Beagle* anchored under the East side of the cape about half a mile S.W. of the rocky islet, and for shelter from westerly winds found it to be very good. The entrance to Port Upright, as it is called, is little more than half a cable across, between an island and a rock a few feet above water; and immediately inside is a kelp patch on the port hand, obliging a vessel to sheer over to starboard. The *Nassau* got 14 fathoms in the entrance; 25 fathoms, rock, in the middle; 22 fathoms, sand, near the head; and 10 fathoms almost touching the beach. If absolutely necessary, a vessel might hold on here with her stern fast to the shore. There is a remarkable dip in the mountain over the head of

the bay, which points it out unmistakeably when you are looking into it. The williwaws would probably come with great force down the gully; when the *Nassau* was there it was calm.

PORT CHURRUCA is stated to afford very good anchorage for large steam-vessels, and seems preferable to Port Tamar for a vessel leaving the strait at Cape Pillar. Its entrance bears South from the West extreme of Tamar Island, and S.E. by E. ¼ E. from Westminster Hall; and may be known by a large glacier, having a remarkable sharp peak, the only one in the vicinity, which is nearly over the anchorage. The glacier will not be seen from the westward till the entrance is well open. Port Churruca is more properly an inlet with two anchorages in it. It trends to the southward about 2 miles, and then S.E., continuing nearly as far in that direction, where it is separated by a low, narrow neck from another inlet which comes in from the southward.

There are two islets off the West entrance of the inlet, and several a little further in on the East side. Passing these a smaller one will be seen off the inner point South. This must be left on the starboard hand, and the bay in which is the first anchorage will open on the port hand when the islet is passed. The anchorage is in 18 to 20 fathoms water, off the entrance of this bay. By continuing further up the inlet instead of turning in for the above, an anchorage in about the same depth of water will be found off the sandy beach on the starboard side; but unless space is required for more than one vessel, it seems useless going further in than necessary. H.M.S. *Challenger*, 1876, found the holding ground bad, and had an anchor broken here.

The *South Coast* of Sea Reach, between Cape Upright and Valentine Harbour (Desolation Harbour of Narborough), was carefully examined by the *Nassau*. Between Cape Upright and Felix Point, Port Churruca is the only good anchorage. *Darby Cove*, just outside Port Churruca, is sheltered from westerly winds, but is too small for anything larger than a schooner.

From Darby Cove the coast trends to the westward 7 miles, having in the interval several indentations, but all with deep water. At Felix Point the land turns in to the S.W., and forms a bay 5 miles wide and 2½ miles deep. At its western side is *Valentine Harbour*, in which the *Beagle* anchored, but it is a poor place. The entrance is narrow, and the *Nassau* could get no bottom at 26 fathoms in the centre, and even there she could barely swing. *Felix Point* is 450 ft. high, and shows as an extreme from either side; it must not be approached too closely, as a rocky ledge covered by kelp extends off it for nearly a mile. *Cape Cuevas*, lying about 2 miles N.W. of Cape Valentine, is the extremity of an island close to the shore, about 380 ft. high.

Truxillo Bay, the first good anchorage West of Churruca, is well sheltered, but has deep water rather near the shore, and did not seem so good as *Tuesday Bay*, the next to the westward, which is for this region an excellent port, well sheltered, and easy of access for the largest steam-vessels, though the entrance is rather narrow for a vessel to beat in. A remarkable needle mountain over

the head of the port marks it well. There is a passage on either side of Nodales Islets, but that to the northward is the straighter and better of the two. These islets are high, and will be seen for some distance outside, and the Quartermasters, off the northern point of entrance, always break. *Tuesday Cove*, immediately outside Tuesday Bay, is well sheltered, and might do for a schooner, but is altogether too small for a vessel of any size. No vessel proceeding to the westward should pass Tuesday Bay without a certainty of clearing the strait before night, as it is the westernmost safe port, and only 13 miles from Cape Pillar.

Cape Cortado (cut off) is a perpendicular rock, about 200 ft. high, well deserving its name, being quite steep-to. From this to Cape Pillar the coast the whole way is foul and dangerous. Rocks above water extend off Mercy Harbour to a distance of 2 or 3 miles, and a wide berth should therefore be given. If the land be visible, Cape Cuevas should be kept outside Cape Cortado, or Cortado never brought to bear eastward of E.S.E. After passing Mercy Harbour, Cortado will show as a near extreme, and Cape Cuevas, though really an island, as said, shows like a promontory joined to the main by a low neck, over which will be seen another point, which projects beyond it.

Skyring Harbour, 3 miles westward of Cortado, is perfectly sheltered when inside, but there are several rocks off its entrance, and it is very narrow and confined.

Port Mercy.—At 3½ miles westward from the western point of Skyring Harbour is Mercy Head, the eastern point of entrance of the harbour of that name. Port Mercy, the Puerto de la Misericordia of Sarmiento, and the Spanish Harbour of Wallis, is the most dangerous harbour in the whole strait, and one to be carefully avoided. When once inside the port the anchorage is fair, but the off-lying dangers are such as to render its entry extremely hazardous.

With such a good harbour as Tuesday Bay within 9 miles, no vessel is justified in going into Port Mercy.

In 1857 the Chilian Government sent the steam-vessel *Maria Isabella* to relieve the crew of a barque which had been wrecked here, and the steam-vessel was also wrecked in the entrance. H.M.S. *Sutlej*, in February, 1863, having got in safely, was almost lost inside. Still later, in 1869, the Pacific Steam Navigation Company's steam-vessel *Santiago* was lost on a rock outside those marked on the chart of that time, and on which the *Nassau* narrowly escaped being lost a fortnight before. Should circumstances, however, render it necessary to enter this dangerous place, abreast the first bight round Misericordia Point is as good a berth as any other.

CAPE PILLAR, the South point of the western entrance of Magalhaens Strait, is a high cape, showing from the eastward as a double nipple. Churruca describes it very well, thus: "Cape Pillar, though conspicuous for its height, is more so on account of the two peaks which rise from its summit with an

inclination to the N.W.; the eastern and higher one belongs to a mountain, from which the cape springs, but the western one is a kind of tower, the base of which we saw on the shore West of the cape, and is of a form to which the name of Pillar might reasonably be given. The extremity common to the strait and to the Pacific Ocean is a large detached rock, which shows the disposition of the strata of which it and the cape are formed. That part of the cape which is washed by the waters of the strait presents a round hill not very high, while the western part exposed to the force of the Pacific Ocean, exhibits large excavations made by the sea in the rock. The eastern and higher peak is 1,395 ft. high, the western one is 1,287 ft." The large detached rock is estimated to be 300 ft. high.

The Tides in Sea Reach are very variable, and sometimes set towards the rocks that front Cape Victory and the Narborough Chain. Captain Stokes remarked a current of about 2 knots here, when 4 or 5 miles West of Cape Pillar, and somewhat southward of it. It is high water, on full and change, at 1^{h}, and the tide rises about 4 feet.

In proceeding into the Pacific, ships, except full powered steam-vessels, should not attempt to clear the strait in one day from Port Gallant, but endeavour to get into Playa Parda or Port Tamar before dark, to be ready for an early start on the following morning, and to fetch a good offing during daylight. As the West and S.W. gales come on suddenly, it is impossible to run back and find an anchorage during a dark night. These remarks apply more to winter navigation.

Captain N. B. Turner, R.N., H.M.S. *Clio*, 1868, remarks: No vessel should attempt to leave an anchorage to pass out of the strait into the Pacific Ocean with a falling barometer, as a westerly gale would cause a greater loss of time than remaining at anchor a day or two for fine weather.

With good observations, and attention to the deep sea lead on closing the land, no difficulty will be experienced in entering the strait from the westward.

CHAPTER II.

THE OUTER COAST OF TIERRA DEL FUEGO, FROM CATHERINE POINT TO CAPE PILLAR, INCLUDING STATEN ISLAND, CAPE HORN, ETC.

The Coast of Tierra del Fuego from Cape Horn to Cape Pillar is very irregular and much broken; being, in fact, composed of an immense number of islands. It is generally high, and free from shoals or banks; but there are many rocks nearly level with the surface of the water, distant 2 and even 3 miles from the nearest shore, which make it very unsafe for a vessel to approach nearer than 5 miles, excepting in daylight and clear weather. The coast varies in height from 800 to 1,500 ft. above the sea. Farther inshore are ranges of mountains always covered with snow, whose height is from 2,000 to 4,000 ft., and in one instance (Sarmiento) 6,800 feet.

With daylight and clear weather a vessel may close the shore without risk, because the water is invariably deep, and no rock is found which is not so marked by sea-weed (or kelp, as it is generally called), that by a good look-out at the mast-head, its situation is as clearly seen as if it were buoyed.

Viewing the coast at a distance, it appears high, rugged, covered with snow, and continuous,—as if there were no islands. When near you see many inlets, which intersect the land in every direction, and open into large gulfs or sounds behind the seaward islands.

You now lose sight of the higher land, which is covered with snow throughout the year, and find the heights close to the sea thickly wooded towards the East, though barren on their western sides, owing to the prevailing winds. These heights are seldom covered with snow, because the sea winds and the rain melt it soon after it falls.

Opposite to the eastern valleys, where the land is covered with wood, and water is seen falling down the ravines, good anchorage is generally found. But these valleys are exposed to tremendous squalls, which come from the heights. The best of all anchorages on this coast is where you find good ground on the *western* side of high land, and are protected from the sea by low islands. It never blows so hard *against* high land as from it, but the sea on the weather side is of course too formidable, unless stopped by islets or other barrier.

The lee side of high land, Captain King remarks, is not the best for anchorage in this country. When good holding can be found to windward of a height, and low land lies to windward of you, sufficient to break the *sea*, the anchorage is much preferable; because the wind is steady, and does not blow home to the heights. Being to leeward of them is like being on the West side of Gibraltar Rock when it blows a strong levanter.

Where the land is chiefly composed of sandstone or slate, anchorages abound; where of granite, it is difficult to strike soundings.

The difference between the granite and slate or sandstone hills, can be distinguished by the former being very barren and rugged, and of a gray or white appearance; whereas the latter are generally covered with vegetation, are dark coloured, and have smoother outlines. These slate or sandstone hills show few peaks, and the only rugged places are those exposed to wind or sea.

SOUNDINGS extend to 30 miles from the coast. Between 10 and 20 miles from the land the depth of water varies from 60 to 200 fathoms, the bottom almost everywhere a fine white or speckled sand. From 10 to 5 miles distant the average depth is 50 fathoms; it varies from 30 to 100, and in some places no ground with 200 fathoms of line. At less than 5 miles from the shore the soundings are very irregular indeed, generally less than 40 fathoms, but in some places deepening suddenly to 100 or more; in others a rock rises nearly to, or above, the surface of the water.

After carrying 50, 40, 30, or 20 fathoms, towards an inlet which you are desirous of entering, you will probably find the water deepen to 60 or 100 fathoms at the entrance; and in the large sounds, behind the seaward islands, the water is considerably deeper than on the outside.*

There is a bank of soundings along the whole coast, extending from 20 to 30 miles from it, which appears to have been formed by the continued action of the sea upon the shore wearing it away and forming a bank with its sand. Between the islands, where there is no swell or surf worth notice, the water is deep, and the bottom very irregular. A small ship may run among the islands in many places, and find good anchorage; but she runs into a layrinth, from which her escape may be difficult, and, in thick weather, extremely dangerous.

Fogs are extremely rare on this coast, but thick rainy weather and strong

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* "I have heard Captain FitzRoy remark, that, on entering any of these channels from the outer coast, it is always necessary to look out directly for anchorage; for farther inland the depth soon becomes extremely great. Capt. Cook, in entering Christmas Sound, had first 37 fathoms, then 40, 60, and immediately afterwards no soundings with 170. This structure of the bottom, I presume, must arise from the sediment deposited near the mouths of the channels by the opposed tides and swell; and likewise from the enormous degradation of the coast rocks, caused by an ocean harrassed by endless gales."—*Darwin*, pp. 266-7.

winds prevail. The sun shows himself but little; the sky even in fine weather, being generally overcast and cloudy. A clear day is a very rare occurrence.

WINDS.—Gales of wind succeed each other at short intervals, and last several days. At times the weather is fine and settled for a fortnight, but those times are few. Westerly winds prevail during the greater part of the year. The East wind blows chiefly in the winter months, and at times very hard, but it seldom blows in summer.

Winds from the eastern quarter invariably rise light, with fine weather; they increase gradually,—the weather changes,—and at times end in a determined heavy gale. More frequently they rise to the strength of a treble-reefed topsail breeze, then die away gradually, or shift to another quarter.

From the North the wind always begins to blow moderately, but with thicker weather and more clouds than from the eastward, and it is generally accompanied by small rain. Increasing in strength, it draws to the westward gradually, and blows hardest between North and N.W., with heavy clouds, thick weather, and much rain.

When the fury of the north-wester is expended, which varies from 12 to 50 hours, or even while it is blowing hard, the wind sometimes shifts suddenly into the S.W. quarter, blowing harder than before. This wind soon drives away the clouds, and in a few hours you have clear weather, but with heavy squalls passing occasionally.

In the S.W. quarter the wind hangs several days (generally speaking), blowing strong, but moderating towards its end, and granting two or three days of fine weather.

Northerly winds then begin again, generally during the summer months; but all manner of shifts and changes are experienced from North to South by the West during that season, which would hardly deserve the name of summer, were not the days so much longer, and the weather a little warmer. Rain and wind prevail much more during the long than the short days.

It should be remembered that bad weather *never* comes on *suddenly* from the eastward, neither does a S.W. or southerly gale shift suddenly to the northward. South-west and southerly winds rise suddenly and violently, and must be well considered in choosing anchorages, and preparing for shifts of wind at sea.

The most usual weather in these latitudes is a fresh wind between N.W. and S.W., with a cloudy, overcast sky.

Gales of wind from the southward, and squalls from the S.W. are preceded and foretold by heavy banks of large white clouds rising in those quarters, having hard edges, and appearing very rounded and solid.

Winds from the northward and north-westward are preceded and accompanied by low flying clouds, with a thickly overcast sky, in which the clouds appear to be at a great height. The sun shows dimly through them, and has a reddish appearance. For some hours, or a day, before a gale from the North

or West, it is not possible to take an altitude of the sun, although he is visible; the haziness of the atmosphere in the upper regions causing his limbs to be quite indistinct. Sometimes, but very rarely, with the wind light between N.N.W. and N.N.E., you have a few days of beautiful weather, but they are generally succeeded by gales from the southward, with much rain.

Much difference of opinion has prevailed as to the utility of the barometer in these latitudes. Capt. FitzRoy says, that during 12 months' constant trial of a barometer and sympiesometer (Adie's) he found their indications of the utmost value. Their variations do not, of course, correspond to those of the middle latitudes, but they correspond to those of high northern latitudes in a remarkable manner, changing South for North (East and West remaining the same).

CURRENT.—There is a continued current setting along the S.W. coast of Tierra del Fuego, from the N.W. towards the S.E. as far as the Diego Ramirez Islands. From their vicinity the current takes a more easterly direction, setting round Cape Horn towards Staten Island, and off to seaward to the E.S.E.

Much has been said of the strength of this current, some persons supposing that it is a serious obstacle in passing to the westward of Cape Horn, while others almost deny its existence. It was found to run at the average rate of a mile an hour. Its strength is greater during West; less, or insensible, during easterly winds. It is strongest near the land, particularly near the projecting capes or detached islands. This current sets rather *from* the land, which diminishes the danger of approaching this part of the coast.

There is, in fact, much less risk in approaching this coast than is generally supposed. Being high and bold, without sand-banks or shoals, its position accurately determined, and a bank of soundings extending 20 or 30 miles from the shore, it cannot much be feared. Rocks, it is true, abound near the land, but they are very near to the shore, and out of a ship's way.

A line from headland to headland (beginning from the outermost Apostle) along the coast will clear all danger excepting the Tower Rocks, which are high above water, and steep-to.

On the western coast, between the parallel of Cape Horn and that of Concepcion on the coast of Chile (and occasionally as far North as Valparaiso), a current sets towards the land; caution is therefore necessary when navigating near this part of the coast, especially during strong westerly winds, and in thick weather.

SEASONS.—It may be as well to say a few words respecting the seasons in the neighbourhood of Cape Horn, as much question has arisen respecting the propriety of making the passage round the cape in winter or in summer.

The equinoctial months are the worst in the year, generally speaking, as in most parts of the world. Heavy gales prevail at those times, though not, perhaps, exactly at the equinoxes. In August, September, October, and

November, you have the worst months in the year. Westerly winds, rain, snow, hail, and cold weather then prevail. December, January, and February are the warmest months; the days are long, and you have some fine weather; but westerly winds, very strong gales at times, with much rain, prevail throughout this season, which carries with it less of summer than in almost any other part of the globe. March is stormy, and perhaps the worst month in the year with respect to violent winds, though not so rainy as the summer months. In April, May, and June, the finest weather is experienced; and though the days shorten, it is more like summer than any other time of the year. Bad weather is found during these months, but not so much as other times. Easterly winds are frequent, with fine, clear, settled weather. During this period there is some chance of obtaining a few successive and corresponding observations. To try to rate chronometers by equal altitudes would be a fruitless waste of time at other seasons. June and July are much alike, but easterly *gales* blow more during July.

The days being so short, and the weather cold, make these months very unpleasant, though they are, perhaps, the best for a ship to make a passage to the westward, as the wind is much in the eastern quarter.

Capt. FitzRoy says that the summer months, December and January, are the best for making a passage from the Pacific to the Atlantic Ocean, though that passage is so short and easy that it hardly requires a choice of time. For going to the westward, we should prefer April, May, and June.

Lightning and thunder are seldom known; violent squalls come from the South and S.W., giving warning of their approach by means of clouds. They are rendered more formidable by snow and hail of large size.

COAST.– From Cape Espiritu Santo, before described on page 8, cliffs from 100 to 300 ft. in height extend, but with few breaks, 23 miles S.E. to *Nombre Head;* the land is 300 or 400 ft. high, irregularly rounded in outline, quite destitute of wood, and, excepting being rather greener, resembling the coast of Patagonia.

South-eastward from Nombre Head extends a low shingle beach, forming a spit, behind which is the large bay of San Sebastian; an excellent anchorage as respects shelter, good bottom, and easiness of access, but without wood, or good watering-place, though water may be procured.

SAN SEBASTIAN BAY is what was formerly supposed to be the entrance of the Sebastian Channel, but the non-existence of which was not proved until the *Adventure* passed it on this side in her exploration of the coast in June, 1830. The charts of this coast had, with this exception, been tolerably correct.

Coasting along the shingle spit, the North point of the bay, the depth is not more than 10 fathoms, but it deepens suddenly near the S.E. extremity. Within the shingle point, which is steep-to, or nearly so, the bottom is uniform, but the depth gradually decreasing. Westward of this point, called

Arenas Point, between it and Cape San Sebastian, there is a spacious harbour, secure from all but easterly winds, which seldom blow, and never with any strength. There is no hidden danger on the North side of the bay; the shingle is steep-to, the shores of the bay shoal gradually, the bottom is clean, and the soundings are regular. On the South side, off Cape San Sebastian, it is otherwise; a shoal rocky ledge extends under water to the north-eastward, and the cape requires a berth of 3 miles; there is no kelp upon it.

CAPE SAN SEBASTIAN is a bold, cliffy headland, of a dark colour; inshore of it the land rises to nearly 1,000 ft. above the sea, and becomes more irregularly hilly. From Cape San Sebastian, a short range of cliff extends, then low land, and then another small cliff, off which there is a rock above water, about a mile off shore.

Hence to *Cape Sunday* the shore is rather low, irregularly hilly, and fronted by a shingle beach. Cape Sunday is a prominent headland, of a reddish colour, rising 250 ft. above the sea; the shores near it are free from danger until near Cape Peñas, near which are some dangerous rocks.

CAPE PENAS is not more than 100 ft. above the sea, and around it, to a distance of 2 miles, there are dangerous rocks, upon which the sea generally, if not always, breaks; but they should be carefully avoided, especially at night.

The bay lying to the southward of Cape Peñas appears to afford anchorage, but the appearance is deceitful—it is shallow, and strewed with rocks. The hills hereabouts are higher, and partially wooded, and the view of the country is pleasing. It is high water at Cape Peñas, on full and change, at $6^h\ 42^m$; springs rise 12 feet.

Capes Santa Inez, *Medio*, and *San Pablo* are high and bold, and fronted by steep cliffs, 200 or 300 ft. in height. Hence to Cape San Diego there is no outlying danger; the water is rather deep near the shore, but not so deep as to prevent a ship anchoring during westerly or southerly winds.

The *Table of Orozco*, 4 miles inland, is a remarkable table-topped hill, about 1,000 ft. above the sea. Between it and Cape San Diego there are three remarkable hills, called the Three Brothers, and the westernmost of these hills is very like the Table of Orozco; they are from 1,000 to 1,400 ft. in height.

Continuing eastward along the coast we come to *Policarpo Cove*, which was dignified by the Spaniards with the title of Port San Policarpo, but which was found by Capt. King to be so shallow an inlet, that at its entrance, just within the heads, there was not more than a fathom of water. From the mast-head it seemed like a spacious harbour. From Policarpo Cove to Cape San Vicente the distance is 12 miles, nearly East, *true*. At 5 miles from the former is False Cove, and between them are the three hills, called the Three Brothers, before mentioned.

Cape San Vicente is a rocky point, with low bluffs above it. Between the cape and Cape San Diego is *San Vicente* or *Thetis Bay*, a tolerable an-

chorage during West or southerly winds, though the bottom is rocky in many places. Between the heads the tides run with great strength; therefore a ship should anchor off a bluff at the West side, and within the lines of the heads, when she will have from 6 to 12 fathoms of water, over a coarse sandy bottom, mixed with patches of rock.

CAPE SAN DIEGO, the eastern extreme of Tierra del Fuego, is a long, low projecting point. A *rocky ledge* projects about 2 miles eastward from the cape, on which are shoaler soundings than nearer the cape; 5 fathoms was found in one spot on it in the *Beagle*. There is a dangerous tide-race over it at times, and vessels should give the cape a berth of 3 miles to avoid it.

From Cape San Diego the land takes a sudden turn to the South, forming the West side of the Strait of Le Maire, which will be presently described. Off the N.E. coast of Tierra del Fuego regular soundings extend for many miles; and good anchorage may be found near the land, on any part of the coast, during westerly winds.

STATEN ISLAND was so named by Schouten, January 25th, 1616, in honour of the States of Holland, and was surveyed in 1828, by Lieutenant E. N. Kendall, of H.M.S. *Chanticleer*. It is 38 miles in extent from Cape St. John to the E.N.E., to Cape St. Bartholomew to the W.S.W. The island is described as extremely mountainous and rugged, being composed of a series of lofty precipitous hills (2,000 ft., and some 3,000 ft. in height), clothed nearly to their snowy tops with forests of evergreen beech trees, the laurel-like winter's bark, and the holly-leaved barberry—these are all evergreens; besides, there are a host of minor plants. The low ground is extremely swampy and boggy, in many parts a perfect quagmire. The writer of this description says that the cold of these regions is a fable, and at variance with truth and nature. At Cape Horn, in lat. 56° S., vegetation was in full vigour in May, or the November of their year, and snow rarely lies upon the low grounds. In fact, we have sufficient matter to elucidate the climate of the South, and to establish its comparative mildness with the North, especially if America be taken as the example. The summers of the South are no means warm or hot, nor winters cold; but to compensate for this, it is the region of wind, storms, and rain, perpetual gales and eternal rains—never twenty-four hours without rain. It is the court of Eolus. The barometric pressure low, the mean being 29.32 inches,—the winds almost always westerly,—electric phenomena extremely rare.

The climate of Staten Island is remarkably humid, and very few days can be passed there, in the course of the year, without rain; and it is rather remarkable that, however fine the weather may have been in the course of the day, some rain generally falls at night. Rain, however, is frequent there in all seasons of the year, and the sky is generally overcast. Thunder and lightning are scarcely known. The temperature may be considered as equally low, and varying little throughout the year. Frost is not very severe, nor very common

in winter. The weather during the summer is cool, but still humid, and, as a general characteristic, may be considered boisterous, unsettled, wet, and dull. Vegetation lingers slowly in its summer's blossom, and is not nipped by the severity of the winter's frost.

On the shore the weather was a few degrees warmer than on board; and at night it was colder. The most retired parts of the island were not frozen. The wind is generally from the westward, 9 days out of 10, ranging from S.S.W. to N.N.W. Gales from the S.W. prevail during the summer, and from N.W. in winter. Easterly winds are most prevalent in the winter months.*

These are the outlines of the climate, to which great attention was paid on board the *Chanticleer*, with the best possible instruments.

Off the North side of Staten Island is the group of islets called *New Year Isles*. To the S.E. by S. of the easternmost is an inlet named *New Year Harbour*, about half a mile broad, and extending 3 miles to the S.W., and having the depths of 30 to 45 and 20 fathoms. A cluster of islets lie in the entrance, and the passage is on the eastern side.

Next to New Harbour, at 1½ mile to the East, is *Port Cook*, a smaller inlet, wherein the late Capt. Foster erected his observatory. It is surrounded by very high land, a mountain on its western side being 2,070 ft. in height above the level of the sea. The entrance is very narrow, and has a depth of only 6 fathoms, but within the depth increases to 16 and 20 fathoms. Lieut. Kendall in his Memoir on Staten Island states that this is decidedly the harbour most eligible for a ship in want of shelter, from the considerations of its affording good anchorage at its entrance, in not too deep water, the greater regularity of the prevailing winds, and the facility of communication with the South side of the island, by means of a low isthmus separating it from *Port Vancouver*, a shoal inlet on that side.

Cape St. John is the easternmost part of Staten Island. It is high and precipitous, and a heavy tide-rip extends from it 5 or 6 miles to seaward, setting at the rate of 6 miles an hour, to the N.N.E. with flood, and S.S.E. with the ebb; but the tide sets along-shore, both on the North and South, from the East to West, from 3¾ or 4 to 2 or 2½ miles an hour. Off Cape St. Bartholomew, the S.W. point of the island, the tide-rip, with flood, sets to the S.W., 5 or 6 miles an hour. This tide-rip likewise is very heavy, and extends 5 or 6 miles to eastward.

St. John's Harbour lies within the promontory of St. John, on the West. It is free from danger, surrounded by high land, and its general depths are from 25 to 20 fathoms, decreasing toward either shore. From the entrance the harbour curves in a S.W. direction to the extent of 3½ miles, but is little more than half a mile broad. The hills of the promontory, on its eastern side,

* Mr. Webster:—Voyage of the *Chanticleer*, vol. i. pp. 129, 130.

are 800 or 900 ft. in height, and at its head on the S.W. is a remarkable elevation, now known as *Mount Richardson.*

Lieut. Kendall has described this harbour, and says that it may be easily recognised at a distance by Mount Richardson. On nearing it a remarkable cliff, like a painter's muller, appears on the eastern shore, which is high and steep. Allowance must be made, in steering, for the set of the tide, which at all times runs rapidly across the mouth of the harbour; it is, however, less sensible when within the headlands forming the N.W. bay, in which, in case of necessity, or to await the turn of the tide, an anchor may be dropped in from 20 to 30 fathoms. The mouth of the harbour is wide, having 25 fathoms in the centre, with a rock standing off at some distance from the western point, to which a berth must be given. The shores, with this exception, are bold, and immediately within the western point is a small bay, where anchorage may be had in 10 fathoms. The most sheltered situation is at the head of the harbour, distant 3 miles S.S.W. from the entrance, where any depth may be chosen between 20 and 5 fathoms, with sandy bottom, and moor with an open hawse to the S.W., from whence the gusts that come from the mountains are violent. The wind, anything to the westward of W.N.W., or even N.W. outside, will be found to draw out of the harbour on nearing its head; and, if at all strong, it will be impossible to beat farther, as it follows the direction imparted to it by every ravine in the hill as it passes; and, therefore, warping will be found the only means of advancing, taking care to have hands by a bower anchor ready to let go, and the cable stoppered at a short scope, in the event of the hawsers being carried away. A ship may readily heave down on a beach of sand at the head of the harbour.

The shores of St. John's Harbour are lined with kelp, which is an excellent indication of its navigable part, the border of it being almost invariably in 8 fathoms, and that close to the shore, the depth rapidly increasing toward the centre, until near the head of the harbour, where the depth gradually decreases to the beach.

Wood and water are plentiful, and easily procured; celery and wild fowl (race-horse or steamer ducks, kelp and upland geese,) may also be obtained; and, in the proper season, October, a good supply of penguin's eggs may be ensured by having men in attendance at a *rookery* about a mile to the eastward of the harbour's mouth.

Westward of Cape Colnett, or the meridian of 64° 18′ are the small harbours named *Port Parry* and *Port Hoppner;* and within New Year Isles, to the West of New Year Harbour, is another, *Port Basil Hall.* These are of inferior consideration. *Port Vancouver*, the only well-sheltered harbour on the South side of Staten Island, is immediately opposite to Port Cook, from which it is separated by a low isthmus. A vessel may ride in security here in 16 or

17 fathoms, sandy bottom, close to a rivulet, and near a convenient wooding-place in the western arm. There is a rocky islet, always visible, on the eastern side of the entrance, and a reef extends some distance from the South point of the western arm, but it will be avoided by not hauling in for the anchorage until a remarkable white ravine on the South shore becomes visible. It possesses the important advantage of affording a place of refuge during a S.W. gale.

To the southward of Staten Island but little amount of tide is perceptible; there is, however, a remarkable undertow, which renders it dangerous for boats to stretch across the mouths of the deep bays, as it is difficult to close again with the land, for which reason the sealers invariably follow the circuitous route of the shores.

Mr. Webster, in his copious description of the vegetable productions of Staten Island, has noticed the vast masses of sea-weed which entangle the shores. The sea teems with it, especially in the rough and open bays, while it is comparatively rare in the sequestered creeks. Did it increase in the calm harbours as upon the rougher shores, they would be choked up; and it would form an impervious mesh of cords. But it thrives best in the boisterous element; and where it would seem impossible to obtain a hold, it there grows and gathers strength to meet the storms.

The STRAIT of LE MAIRE, between Tierra del Fuego and Staten Island, was so named from the navigator who discovered it in 1616. It is said, in the relation of Anson's voyage, that it is difficult to determine exactly where the strait lies, though the appearance of Tierra del Fuego be well known, without knowing also the appearance of Staten Island; and that some navigators have been deceived by three hills on Staten Island, which have been mistaken for the *Three Brothers* on Tierra del Fuego, and so overshot the strait. But Capt. Cook says no ship that coasts Tierra del Fuego within sight of land can possibly miss the strait, for it will then of itself be sufficiently conspicuous; and Staten Island, which forms the eastern side, will be still more manifestly distinguished, for there is no land on Tierra del Fuego like it. The Strait of Le Maire can be missed only by standing too far to the eastward, without keeping the land of Tierra del Fuego in sight; if this be done, it may be missed, however accurately the appearance of the coast of Staten Island may have been exhibited; and if this be not done, it cannot be missed, though the appearance of the coast be not known. The entrance of the strait should not be attempted but with a fair wind and moderate weather, and upon the very beginning of the tide of flood, which happens here, at the full and change of the moon, about 1 o'clock. It is always best to keep as near to the Tierra del Fuego shore as the winds will admit. By attending to these particulars, a ship may get quite through the strait in one tide; or at least to the southward of *Good Success Bay*, into which it would be more prudent to put, if the wind should be southerly,

than to attempt the weathering of Staten Island with a wind and lee current, which may endanger her being driven on that island.*

Capt. J. M. Gray, of the British barque *Shun Lee*, from long experience, recommends that sailing vessels coming from the northward should not attempt to enter the strait until one hour after high water. He states that it is his practice on arriving near the strait to wait 5 or 6 miles to the northward, until a little after high water. Also that in March, 1881, he entered the strait at that time of tide, and although it was blowing a gale from the S.W., the ship drove through rapidly.

The Cape of Good Success, in lat. 54° 55′, is the S.E. point of the Strait of Le Maire. It is high and bluff, and some rocks lie close to it, above water.

Rather more than 2 miles north-eastward of Cape Success is a projecting headland, which at first appears to be the cape; two rocky islets show themselves close to it, and, from a distance, appear like a ship under sail. At 6 miles from these rocks, N. $\frac{3}{4}$ E., is *Good Success Bay*, which is visible from the northern entrance of the strait. The bay is about 2 miles wide, and extends into the land westwardly $2\frac{1}{2}$ miles. It may be easily known by a peculiar mark or feature on its southern side—a barren strip of land on the height, resembling a broad turnpike road extending into the country from the shore. This mark, which is mentioned by Cook, is still a good one for the bay, if the inbend of the land does not show it sufficiently. This mark was stated to be overgrown with trees in 1882. The anchorage is good all over it, in from 4 to 12 fathoms of water, clear ground. Here a vessel lies perfectly safe, provided she does not anchor too far in, toward the sandy beach at its head; for during S.E. gales a heavy swell, with dangerous rollers, sets right into the bay. Elevated lands, of about 1,200 ft. above the sea, surround the bay, therefore, with strong winds, it is subject to squalls, which, during westerly gales, are very violent. It was here that two of Capt. Cook's party perished from cold in January, 1769. Sir Joseph Banks and Dr. Solander were with them.

Mr. Darwin says: "The harbour consists of a piece of water half surrounded by low rounded mountains of clay slate, which are covered to the water's edge by one dense gloomy forest. A single glance at the landscape was sufficient to show me how widely different it was from anything I had ever beheld. One side of the harbour is formed by a hill about 1,500 ft. high, which Capt. FitzRoy has called after Sir J. Banks, in commemoration of his disastrous excursion."

Although this is an excellent stopping place for vessels of any size, in which they may find wood and water, it will not answer if a vessel requires to lie steady for repairs, as a swell frequently sets in. In the winter season, when

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* Cook's First Voyage, date 16th January, 1769. If we may judge from the varying descriptions, we may suppose that the climate has rather ameliorated since 1769. Similar remarks have been made with regard to the Falkland Islands.

easterly winds are common, no vessel should anchor so near the head of the bay as she may in summer.

The Eastern Side of the Strait of Le Maire, already noticed, is formed by the very irregular bays and rugged capes of Staten Island; surrounding the latter are heavy tide-rips, which extend outward to a considerable distance, and render a near approach very dangerous. *Middle Cape* lies in lat. 54° 48′ 20″ S., long. 64° 45′ W. This, with *Cape St. Anthony*, the N.W. cape, and *Cape St. Bartholomew*, the S.W. cape, are high, bluff promontories.

The soundings in the strait are regular near the southern entrance, 70 to 30 fathoms, over a sandy bottom; towards the North the soundings diminish, and at 2 miles from Cape San Diego there is not more than 30 fathoms, over a rocky bottom. The strait is generally clear, excepting a reef discovered by Captain E. Handfield, in passing through in H.M. sloop *Jaseur*, in 1827, which is said to lie about 3 miles West from Middle Cape. It appeared to be about 1½ mile in extent, and the sea broke violently on it.

The TIDES of Good Success Bay and the Strait of Le Maire are as regular and as little to be dreaded as in any part of the world where they run with strength. They will materially assist any vessel in her passage through the strait, which is very wide, perfectly free from obstacles of any kind, and has Good Success Bay close at hand, in case wind or tide should fail. When the tide opposes the wind and swell, there is always a heavy and, for small vessels, dangerous "race" off Cape San Diego: in one spot, where the water is more shoal than elsewhere, 5 fathoms only was subsequently found at a neap flood tide; but let it be remembered, that on another day, at the top of the springs, being the day after full moon, we passed the same spot at half-flood, with the water perfectly smooth; and, although strong eddies were seen in every direction, the vessel's steerage was but little affected by them. It is high water in Good Success Bay soon after 4 in the afternoon on the full and change days, and low water at 10 in the morning. The flood tide stream begins to make to the northward about an hour after low water; and the ebb to the southward about the same time after high water. The tides rise from 6 to 8 ft. perpendicularly. At Cape Pillar, the turn of tide, with high water, is at noon; but along the S.W. and S.E. coast the time gradually increases to this coast. From Cape San Diego the flood tide sets North and West along the shore, from 1 knot to 3 knots each hour, as far as 20 miles along the shore, and the ebb in a contrary direction, but not so strong, except in San Vicente Bay. The flood in the Strait of Le Maire runs about 2 knots in mid-channel, more or less, according to the wind, and the ebb about 1 knot an hour. Perhaps, at times, when a strong spring tide is retarded in its progress by a northerly wind, there will be a dangerous overfall off Cape San Diego, like the bores in some parts of the world.

"I cannot see why there should be any objection to the passage through the Strait of Le Maire, as it gives a vessel a much better chance of making the passage round the cape quickly. A vessel with the tide will pass through in a

few hours. As for the 'race and dangerous sea,' I have fully experienced it on the *Porpoise*, on the side of Staten Island; and am well satisfied that any vessel may pass safely through at all times, and in all weathers, or, if not so disposed, may wait a few hours until the sea subsides, and the tide changes. We were only three hours in passing through."—(Narrative U.S. Exploring Expedition, vol. i., p. 107.)

Valentyn Bay is the name applied to the inlet westward of Cape of Good Success. Good Success Bay was originally called by this name, but it is transferred in the late surveys to the present, which is unfit for vessels, being exposed to a heavy swell, and affording but bad anchorage.

Between this bay and Aguirre Bay, the next to the westward, is the *Campana* or *Bell Mountain*, 2,600 ft. high, and in shape resembling a large bell. It is seen far at sea from the North as well as the South.

Cape Good Success, as before stated, is high and bluff; and the land between it and Bell Mountain is higher than that to the westward.

Aguirre Bay is unfit for a harbour except for temporary anchorage, and Spaniard Harbour, its N.W. part, is a shallow bay, full of rocks, and dangerous reefs lining the shore, and without shelter, although there is anchorage for a vessel.

SPANIARD HARBOUR possesses a very melancholy interest, as it was here that a party of zealous missionaries, headed by Capt. Allen F. Gardiner and R. Williams, surgeon, seven in number, perished most miserably of starvation between June and September, 1851. The history of this ill-judged expedition has been well discussed, and need not be so here. The remains of these most unfortunate and amiable men were found in a miserable condition a long time afterwards, and memorials were placed over them.—(*See* "Voyage to Tierra del Fuego," by W. Parker Snow, vol. i., chap. xx.)

The tide is strongly felt on this part of the coast, causing races and eddies near the projecting points. In the offing the current (or tide) sets towards the Strait of Le Maire, from 1 to 3 knots an hour, when the water is rising on the shore, and the wind westerly. While the water is falling, it runs with less strength, and with an easterly wind is not felt at all.*

Westward of *Point Kinnaird* (on which great numbers of fur-seal were seen from the *Adventure*), the southern coast of the island of Tierra del Fuego trends in nearly a due West direction, through 6 degrees of longitude; the coast in

* "On May 11th (1830), we passed through a very dangerous tide-race off Bell Cape. There was little or no wind, but it was scarcely possible to use our oars, so much was the water agitated; it was heaving and breaking in all directions, like water boiling in an immense cauldron. When through, and again in safety, I was astonished at our fortunate escape. Looking back upon it, only a mass of breakers could be seen, which passed rapidly to the westward, and therefore led me to suppose that this race was caused by a meeting of tides, not by a strong tide passing over a rocky ledge."—*Mr. Murray, Voyage of the Adventure, &c.*, vol. i., p. 447.

some portions being of that peculiarly straight character observed in many parts of this wild region, more particularly in the Strait of Magalhaens. South of this line the outer coast is broken into numerous islands, separated from the principal island by the Beagle Channel.

A range of high mountains runs almost uninterruptedly from the Barbara Channel, in long. 72° 20′, to the Strait of Le Maire. Mount Sarmiento (p. 28) is in this range, and is 6,800 ft. above the sea. *Mount Darwin* is of the same height, and is near the point where the Beagle Channel separates into two branches, diverging to the North and South of West. Southward of these mountains is a succession of broken land, intercepted by passages or large sounds. A boat can go from the Week Islands, S.E. of Cape Pillar, the western entrance of the Strait of Magalhaens, to the eastern entrance of the Beagle Channel, without being exposed to the outside coast, or to the sea which is there found.

BEAGLE CHANNEL was discovered by Mr. Murray in the course of the survey of this coast, April, 1830 :—"The master returned, and surprised me with the information that he had been through and far beyond Nassau Bay. He had gone very little to the northward, but a long distance to the East, having passed through a narrow passage, about one-third of a mile in width, which led him into a straight channel, averaging about 2 miles or more in width, and extending nearly East and West, as far as the eye could reach. Northward of him lay a range of mountains whose summits were covered with snow. On the South side of the channel there were mountains of considerable elevation; but, generally speaking, the shore was lower than the opposite.—*Capt. King.*

Beagle Channel is easy of access, but it is useless to a ship. Boats may profit by its straight course and smooth water. (But see remarks on the people below.) It runs 120 miles, in nearly a straight line, W.S.W. and E.N.E., between snowy mountains, as above stated, and averages about 1½ mile in width, and in general has deep water; but there are in it many islets, and rocks near them.

Ushuwia Mission Station was established in 1869 on the North shore of Beagle Channel, on the South side of a bay about 8 miles long, sheltered by a small peninsula N. by E. from the Murray Narrows or northern entrance to Ponsonby Sound, and which may be used as a place of refuge and relief to mariners shipwrecked in the vicinity of Cape Horn. The approximate position of the mission is in lat. 54° 53′ S., long. 68° 12′ W. The entrance to the harbour is narrowed by some islands, but inside there is anchorage in 7 to 10 fathoms.

"If a ship be abandoned to the westward of Cape Horn, the most direct course for boats is, to pass eastward of False Cape Horn, and through Ponsonby Sound, using Packsaddle Island for a stopping place, where it is considered the natives are to be trusted, but avoiding communication with natives

in Ponsonby Sound until near the North part of it, as they are said to be very hostile.

"For crews escaping when to the eastward of Cape Horn, the best course would be to the eastward of Navarin Island and westward through Beagle Channel; stopping, if necessary, at Banner Cove in Picton Island, or at the Narrows of Beagle Channel, where, on the South shore, friendly natives are settled, and from which the Mission is distant about 30 miles.—*Vice-Admiral Sir B. J. Sullivan, K.C.B.* (1871.)

Picton Island, in the entrance of Beagle Channel, was the place where Capt. Gardiner first fixed his quarters, in his benevolent wish to improve and Christianize the Fuegians, in 1848. The site was in Banner Cove, on the North side of the island, a very pleasant spot, as the entire island is described as a park-like, very pleasant looking island. The site of Capt. Gardiner's two attempts was evidently adapted for a mission station, had other considerations been equally advantageous.

It should be remembered that the passage through Beagle Channel is attended with other risks than those of navigation, in the hostility of the natives, who are numerous hereabout, and on this head the greatest caution is required, as stated on pp. 2—4.

New Island is high, and said to be visible 25 or 30 miles off. It lies at the South side of the entrance to Beagle Channel, and was observed at a distance by Cook. Good temporary anchorage during westerly winds may be obtained under it, or near the shore to the northward.

Lennox Island, as well as New Island, and all the coast hereabout, may be approached with confidence, using the lead, and looking out for kelp. There are no shoals, but the water is not so deep as to the West of Cape Horn, neither is the land nearly so high.

At the East of Lennox Island is *Lennox Cove*, a very secure place for small vessels; but, as it is rather shallow, ships drawing more than 14 ft. of water should anchor outside of the entrance, where they would be safe and in smooth water, excepting when a S.E. gale blows, with which wind they would, in all probability, wish to remain at anchor. The soundings are regular in the offing, and there is anchoring ground everywhere in the vicinity. Wood and water may be obtained in any quantity. Wild fowl and fish are also to be had, but not in abundance. The easiest way of getting fish is to give bits of broken glass or buttons to the natives, who catch them in the kelp.

Goree Road lies between Terhalten Island and the S.E. part of Navarin Island, or rather between Lennox Island and Navarin Island. There is good anchorage in it with 6 and 7 fathoms water over a sandy bottom. According to Capt. FitzRoy, it is an excellent place for ships, very easily entered or quitted, and able to furnish wood and water with as little trouble as any harbour on the coast. It should be remarked here that the kelp in Goree Road, as well as that which extends out from Guanaco Point, partly across the entrance to the road,

does not, as far as we have been able to discover, grow upon rock, but upon loose detached stones, and need not be a subject of alarm.

NASSAU BAY.—South of Navarin Island is Nassau Bay, the South side of which is formed by Wollaston Islands. It extends to the North and N.W. by Ponsonby Sound and the Murray Narrows into Beagle Channel. There is nothing to lead a vessel into these openings, therefore a description of them is not necessary. They may prove useful for boats; and the charts will be sufficient guides for this purpose. Nassau Bay is very accessible and free from dangers, the only ones being some rocks or islets above water and visible by daylight. Anchorage may be found on either coast. The compasses are very sluggish here, and might cause a serious error if not attended to.

Dædalus Rock, discovered in 1850, lies three-quarters of a mile N.N.E. from Dædalus Island in the North part of *North Road*, which is at the N.W. end of Wollaston Island. It has only 3 ft. water on it, and is therefore very dangerous, though buoyed with kelp. A rock is stated to lie about 1½ mile N.E. by E. from Dædalus Rock, on which the barque *Hazeltine*, in 1878, struck and was wrecked.

Capt. FitzRoy says: "If bound round Cape Horn from the eastward, it might be preferable to work through Nassau Bay, and stand out from False Cape Horn, instead of making westing in the open sea, as is usually done. There are no dangers but those which are shown in the chart; the water is comparatively smooth, and an anchorage may be taken at night. For this purpose, Goree Road, or North Road, or Orange Bay may be chosen.

"When it blows too hard to make any way to windward, it is at least some satifaction, by lying quiet, to save wear and tear, and to maintain one's position, instead of being drifted to leeward, and perhaps damaged by the sea in the offing. There is less current through the bay than in the offing, near Cape Horn."

Ponsonby Sound leads from Nassau Bay to Beagle Channel, insulating Navarin Island; on the West side of the latter is *Woolya*, where Jemmy Button was deposited by Capt. FitzRoy, after his visit to England, in 1834. At *Button Island*, in the Sound, and off Woolya, Capt. Parker Snow met with him again in 1853, as related on page 3.

Evouts Isles, consisting of one principal, with several smaller islets and rocks to the South and North, lie off the mouth of Nassau Bay. They are similar to the Barnevelts, but rather higher, being visible 20 to 25 miles off, and the chart is a sufficient description. Within them are Sesambre and Terhalten Isles.

Barnevelt Isles are to the southward of Evouts. They are two low islets lying nearly North and South, covered with grass, tussac, and weeds. The largest is about half a mile long, and one-third of a mile wide; the other is about 2 cables' lengths square. Several rocks lie off the South end both to the

NORTH-EAST SIDE OF WOLLASTON ISLAND NEAR CAPE HORN.

From Adm. Fitz Roy's Voyage of the "Beagle".

East and West; and one above water lies detached, towards Hermite Islands, nearly in mid-channel. There is no good landing place on the islands.

The HERMITE, or CAPE HORN ISLES, are the group lying southward of Navarin Island and eastward of Hardy Peninsula, and of which Cape Horn is the southernmost point. The first name is given from that of Admiral Hermite, commander of the Dutch fleet, who visited the coast in 1624. The principal island is *Wollaston Island*, the northernmost, separated by Franklin Sound from Hermite and Herschel Islands, and these by St. Francis Bay from Horn Island. Wollaston Island consists of two islands, the western of which is called *Bailey*, from the Vice-President of the Royal Society. It is very probable that Wollaston Island, as well as Hardy Peninsula to the westward, consists of a series of islands separated by channels which run in from the heads of the numerous bays. Capt. Parker Snow felt almost certain that such was the case.

Victoria Harbour is one of these, a large expanse of water lying in the middle of what was supposed to be one island, Wollaston Island. It is a pleasant and secure place, easy of access, through the northern or *Sea Gull Passage*, and possibly the same by the Washington Channel from the southward. It is worthy of attention in case a vessel might be caught here in one of the frequent gales. A recent newspaper cutting contains the following :—

"The captain of the British barque *Cedric*, of Liverpool, which has just arrived at Valparaiso, reports to the authorities of that port that he had found a splendid bay, with safe anchorage, in the Island of Wollaston, 29 miles distant from Cape Horn, and protected from all winds and storms. The *Cedric* was anchored 14 days in this fine bay, taking in wood and water. The vegetation all around is described as magnificent. The Indians were found to be docile, and they use canoes of bark covered with the hide of the sea-lion. The captain of the *Cedric* says the harbour is superior even to that of the Falkland Islands. The Chilian Government, in consequence of the above information, was about to send orders to Capt. Simpson, who commands at present a Chilian Coast Surveying Expedition in Patagonia, to proceed to and examine into the claims of this Island of Wollaston."

The passages between these islands have deep water, and are free from dangers; what few rocks there are show themselves above water, or are thickly covered with kelp.

Deceit Island.—The island next West of the Barnevelts is Deceit Island, the easternmost of the Hermite Islands, and the southernmost point of which is *Cape Deceit* (or Enganno), the *Mistaken Cape* of Capt. Cook. It is a rocky point, and off it are several rocks all above water; at 2 miles to the S.E. is a cluster rising 30 or 40 ft. above the sea. Strangers should be careful not to mistake it for Cape Horn, for such mistakes have occurred, as its name imports. It lies 10½ miles S.W. ¾ S. from the Barnevelts.

CAPE HORN is the southernmost point of the southernmost of the Hermite Islands. There is nothing very striking in the appearance of this promontory as seen from a distance; but on passing near it is more remarkable, showing high black cliffs towards the South, and is about 500 ft. above the sea. Its summit is in lat. 55° 58′ 40″ S., long. 67° 16′ 10″ W.

Cape Horn* was but little known till Capt. FitzRoy's surveys. Capt. Cook said, "In some charts Cape Horn is laid down as belonging to a small island. This was neither confirmed, nor can it be contradicted by us; for several breaks appeared on the coast, both to the East and West of it; and the hazy weather rendered every object indistinct." The surveying expedition under Captain P. P. King landed on the cape on the 20th of April, 1830, and erected a pile of stones, 8 ft. high, over a memorial of their visit.

Off the East point of Horn Island are some small rocks and breakers, and 1 mile to the westward of Cape Horn there are three rocks generally above water; the sea always breaks on them.

Between Horn Island and Hermite Island is St. Francis Bay, formerly much misrepresented on the charts. It is clear of obstruction, and has no other dangers than those indicated in the late surveys.

A strong *current* sets, at times, along the outer coast of the Hermite Islands, and through the Bay of St. Francis. It varies from half a knot to 2 knots an hour, according to the wind and the time of tide; and, in the bay, changes its direction with the change of tide.

The land of Hermite Island and its vicinity has a most remarkable appearance when seen from the South. Its outline is a series of peaks, following each other in regular succession, and resembling the worn teeth of an old saw. Mount Hyde is sufficiently distinct by its rounded apex, and by being higher than any land near it. *Kater's Peak*, 1,742 ft. above high water level, is also very remarkable in this view, from its conical form and very pointed summit, also from being situated at the eastern end of the island.*

WIGWAM, or St. Martin's Cove, on the eastern side of Hermite Island, westward of Cape Horn, has been described by Capt. Foster. It bears from the cape W. by N. ¾ N. about 10 miles, and is a place of easy access with N.E., East, and S.E. winds. It is open to the East, and may be readily found by means of *Chanticleer Island*, which lies about a mile *true* East from the South head of the entrance. With westerly winds, which are adverse and prevalent,

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* "Cape Horn, or more properly *Hoorn*, was named by Le Maire and Schouten in 1616, in honour of the town of Horne, or Hoorn, in West Friesland, on the Zuyder Zee, near Amsterdam, of which the patron was a native."—*Navig. Austral. de la Maire.*

† The survey of this point now presents the navigator with the means of ascertaining his position to a nicety, by angles taken with a sextant between Cape Horn summit and Jerdan's Peak, or Mount Hyde and Kater's Peak; and if Jerdan's Peak and Mount Hyde be brought in a line, and an angle taken between them and Cape Horn summit, the operation will be still more simple.

sailing vessels should anchor off the entrance, in about 22 fathoms, and warp into the cove, where there is a convenient berth in 18 fathoms, sandy bottom, midway from either side, and about half a mile from the head of the cove. This anchorage is safe, although the gusts of wind in westerly gales, which are of frequent occurrence at all seasons of the year, rush down the sides of the mountains in various directions with impetuous violence, and may be very properly called *hurricane squalls* (williwaws). They strike the ship from aloft, and have more the effect of heeling the vessel than of bringing a strain upon the anchors, which, when once imbedded in the sandy bottom, hold remarkably well, and will cost a heavy heave in weighing.

It is high water, on full and change, at $3^h\ 50^m$; the rise is about 8 ft. It appeared that the flood came in from the southward.

Wood and water abound in every part of the cove, but cannot always be procured, from the steepness of the shores, and the heavy swell that sometimes sets in. The water is highly coloured by the vegetable matter through which it percolates; but no other inconvenience from its use was found than that of imparting to tea a deeper colour, and somewhat unpleasant flavour. The wood was very much twisted and stunted in growth, and did not seem fit for any other purpose than fuel.

The shores of the cove are skirted with kelp, which serves to protect the boats in landing, and amongst which fish also are to be caught with a hook and line, abreast of the rills of fresh water that discharge themselves into the sea.

At the head of the cove, and a few feet beyond the reach of high water, spring tides, abundance of celery is to be found, as also in many other places in the cove. During two months of the latter part of the autumnal season, a sufficiency was daily procured for the use of the ship's company of the *Chanticleer*, and although of not so luxuriant a growth as in December, it was, nevertheless, considered wholesome.

St. Joachim's Cove, to the southward of St. Martin's Cove, is more exposed than the latter, but is of easier depth. These coves are separated from each other by a steep and precipitous mass of hills of greenstone, which in many parts appear to be stratified, the dip being to the westward, at an angle of 40°. The whole surface of the hill is covered with stunted beech bushes, thickly matted, and interwoven with each other.

Temporary anchorage may be had in the small bay leading to St. Joachim's Cove, or under the South head of St. Martin's Cove, where you will find from 20 to 25 fathoms, over a clear, sandy bottom.

Port Maxwell is contained between Jerdan Island, Saddle Island, and a third island, forming a triangle. It has four entrances; only two of them are fit for vessels—those to the North and East; the principal one being to the North of Jerdan Island. The best berth in it is in 16 fathoms water, over a sandy bottom. This harbour is decidedly good, though it requires a little more

time and trouble in the approach. It is rather out of the way, but is perfectly secure, and untroubled by mountain squalls or williwaws.

The summit of *Saddle Island* is composed of large blocks of greenstone rock, the ferruginous nature of which has a very remarkable effect upon the compass, as, indeed, is found to be the case in many parts near these islands. This island, like the others near it, is clothed with low stunted brushwood of beech, berberis, and arbutus; and on its shores kelp-fish, a very delicate and wholesome fish, may be caught.

Cape Spencer is the southernmost point of Hermite Island. It protected the surveying vessel very well, both from wind and sea, during an anchorage there. Should a ship wish to enter St. Martin's Cove, and the wind or daylight fail her, she will find this spot a convenient stopping place. The West point of Hermite Island is low; the land at the opposite end of the island high and rugged.

FALSE CAPE HORN, the S.E. point of Hardy Peninsula, is a very remarkable headland; from the East or West it looks like a large horn. It is a leading mark to the best anchorage on this coast, Orange Bay. Strangers should be careful not to mistake this cape for Cape Horn, for such mistakes have occurred, as the name imports. Off the cape are several rocks, all above water; and at 2 miles to the N.E. is a cluster rising 30 or 40 ft. above the sea.

Orange Bay, on the eastern side of the peninsula, is excellent, and one of the few on this coast which are fit for a squadron of line-of-battle ships. Its approach from the sea is as easy as the harbour is commodious. There is 3 fathoms close to the shore, yet in no part is there more than 20 fathoms; and everywhere there is a sandy bottom. Water is abundant, and wood grows close to the sea; wild fowl are numerous; and, although shell-fish are scarce, plenty of small fish may be caught with a hook and line among the kelp, and in summer a sieve will furnish abundance.

To anchor in this bay, you must pass to the eastward of the False Cape, as close as you please. Steering *N.E.* (*true*) for 4 miles, will bring you abreast of Point Lort; a bay 2 miles wide is then opened, in which you may anchor, if necessary, in 8 or 10 fathoms, over a fine sandy bottom. Some rocks above water lie at the North side. Beyond the point which forms the North side of this bay is a small cove, with 18 fathoms water in the middle; beyond it is another larger cove, after which you open Schapenham Bay (so called by the Nassau fleet). A North course (*true*) from Point Lort will take you abreast of Orange Bay.

Schapenham Bay is 1½ mile wide; at its head is a large waterfall, marking a rocky bottom, covered with kelp. It is not recommended to anchor in this bay. *Rice Bay*, southward of Schapenham Bay, affords a small but sheltered anchorage, in 6 fathoms, sand. Wood and water are plentiful. Captain Rice,

From Adm. Fitz Roy's Voyage of the Beagle.

of the barque *River Boyne*, 1875, which caught fire off Cape Horn, ran her aground here abreast the stream at the head of the bay, on a level sandy bottom, where she remained five days, during which there was no swell.

The land behind those coves that have been mentioned is high and rugged; two singular peaks show themselves, which resemble sentry boxes. Near the shore the land is low, compared with other parts of the coast. From the heights sudden and very strong squalls blow during westerly winds. Being generally a weather shore, and regular soundings extending along it, there is no difficulty in choosing or approaching an anchorage.

Off Orange Bay, anchor soundings extend to 2 miles off the land. The opening of the bay is 3 miles wide, and in that part there is 18 or 20 fathoms, over fine speckled sand. Two islands, the larger having a smooth, down-like appearance, lie in the middle; behind them is the harbour, a square mile of excellent anchorage, without a single rock or shoal. The bottom everywhere is a fine speckled sand. You may go close to the shore in every part. The best watering-place is a small cove at the North side, called Water Cove.

Off the North point are several small islets, which must not be approached too closely; they are, however, out of the way. Orange Bay is somewhat open to East winds, but they seldom blow strong, and would be fair for ships bound westward. No sea can be thrown in, because of the Hermite Islands. There is no current here worthy of notice. It is high water, on full and change, at $3^h\ 30^m$; springs rise 6 feet.

At 6 miles N.N.W. of the outer anchorage is *Packsaddle Island*, a curious island, like a castle or pack-saddle, on the North side of Packsaddle Bay.

DIEGO RAMIREZ ISLANDS, discovered by the *Nodales*, in 1619, and so named after their head pilot, are a cluster of great barren rocks, 56 miles S.W. ½ S. from Cape Horn, which extend N.N.W. and S.S.E., 4 or 5 miles. The channel between is entirely clear.

There are three principal isles, and many rocks above water. The centre isle is the largest; it has tussac upon it, but neither wood nor water, and is frequented by various oceanic birds. The second in size has a shingle beach, where a boat may be hauled up in safety; and there is enough good water on the East side of the same island to supply thirty men. A furious surf breaks on the West shore, and sends a spray over the whole island. There is no sheltered anchorage for a vessel. The westernmost rock is the highest, and is surrounded by several small rocks sufficiently elevated for birds and seals. Around the rocks the water is bold within a cable's length; and in clear weather a ship may safely run for them in the night, by keeping a good look-out. The highest point is about 150 or 200 ft. above the sea. They are very similar to the Ildefonsos; the top of the ridge of hills showing above the water, and broken through by the sea.

On the East side is a depth of 30 fathoms, with a bottom of fine green sand.

The tide of flood here runs to the N.E., and apparently to the eastward, among many of the main islands.

ILDEFONSO ISLES.—These are a group of rugged islets and rocks, above water, bold-to, and within which Capt. Cook passed to the eastward, in December, 1774. They extend 5 miles in a N.W. and S.E. direction, are very narrow, and the highest and largest is about 150 ft. above the level of the sea. They have been much frequented by the sealers. Their distance from the nearest point of the main is about 20 miles. The passage between them and Diego Ramirez is 36 miles wide, and entirely free from danger.

Capt. Weddell says that the largest isle is not more than a quarter of a mile long. On a N.W. or S.E. bearing the whole appear as two islets only; but the northern one is merely a cluster of detached rocks: the southern islet is the largest and highest, and contains a quantity of tussac on its top, and sea-gull rookeries. The isles have no beaches, and can be landed on only when the water is very smooth. Between them is a channel of a mile wide, which, being rocky, should not be used.

Bourchier Bay lies between False Cape and New Year Sound. It offers nothing inviting for ships, being a leeward bight, with rocks and islets scattered near the shore.

NEW YEAR SOUND, &c.—To the northward of the Isles of St. Ildefonso, the coast of Tierra del Fuego forms the large inlet or strait called *New Year Sound*, for a knowledge of which and its harbours the public is especially indebted to Capt. Weddell, who has given a plan of it in his useful volume. Opposite to the entrance is an extensive group of isles, of which the central and largest is *Henderson Island;* on the East is a smaller, *Sanderson;* and on the West, *Morton*, with a number of islets. A remarkable hill, *Mount Beaufoy*, on Henderson Island, stands in lat. 55° 36′ 15″ S., long. 68° 58′ W. Capt. Martial, of the French vessel *Romanche*, 1883, reported a dangerous rock to lie 2 miles S.E. by S. ¾ S. from Brisbane Head, the South point of the island. On the N.W. side of Morton Isle is a harbour named *Clearbottom Bay;* and at 5 miles above this, on the western side of the inlet, upon the main, is another harbour named *Indian Cove;* but the last, Capt. King says, cannot be recommended, as a vessel must go far among the islands to reach it, and when there have a bad rocky bottom, with deep water, one corner only excepted. For a description of the inhabitants hereabout, see *Weddell*, pp. 172—184.

Clearbottom Bay, on the N.W. side of Morton Island, is an anchorage, which, by being close to the coast, is convenient for a vessel to touch at for wood and water. In order to gain this place from sea, bring the easternmost island of St. Ildefonso S. ½ E., and steer N. ½ W. for *Turn Point*, the western point of an islet on the parallel West of the harbour. About 1½ mile to the E.N.E. of this point is the anchorage; and at the distance of 3 cables' lengths

from the shore, in 22 fathoms of water, bottom of sand and clay, is the most eligible berth for anchoring.*

Rous Sound and *Trefusis Bay*, westward of New Year Sound do not afford anchorage. *Hope Island* (of Capt. Weddell) lies off the Wood Islands, and is 15 miles E. ½ S. from York Minster. There is no good anchorage among the Wood Islands. Passages and broken land lie behind them to the northward. Off Point Nativity are two islands and an outlying rock.

CHRISTMAS SOUND.—Capt. Cook, on his return from his second voyage, December, 1774, entered here: we quote his words:—"The festival which we celebrated at this place occasioned my giving it the name of Christmas Sound. The entrance, which is 3 leagues wide, is situated in lat. 55° 27′ S., long. 70° 16′ W.; and in the same direction of *N.* 37° *W.* (*true*) from the Isles of St. Ildefonso, distant 10 leagues. These isles are the best land-mark for finding the Sound. York Minster, which is the only remarkable land about it, will hardly be known by a stranger from any description that can be given of it, because it alters its appearance according to the different situations it is viewed from. Besides the black rock which lies off the end of Shag Island, there is another, about midway between this and the East shore. A copious description of this Sound is unnecessary, as few would be benefited by it. Anchorage, tufts of wood, and fresh water, will be found in all the coves and harbours. I would advise no one to anchor very near that shore for the sake of having a moderate depth of water, because there I generally found a rocky bottom.

"The refreshments to be got here are precarious, as they consist chiefly of wild fowl, and may probably never be found in such plenty as to supply the crew of a ship; and fish, so far as we can judge, is scarce. Indeed, the quantity of wild fowl made us pay less attention to fishing. Here are, however, plenty of mussels, not very large, but well tasted; and very good celery is to be met with on several of the low islets, and where the natives have their habitations."

MARCH HARBOUR, at the East end of Waterman Island, was so named by Capt. King, who passed the month of March, 1830, here in the *Beagle*, and built a boat. This harbour might be useful to other vessels, its situation being well pointed out by York Minster, and affording wood and water with as little trouble as any place in which the *Beagle* had anchored. The harbour is large, with good holding ground, but there are many rocky places; and one rock under water, having only 1 fathom on it, marked by very thick kelp. The *Beagle* worked through the narrow passage, round Shag Island from Adventure Cove, and into the innermost corner of the harbour without using a warp; larger

* There is a considerable tide between Morton Isle and the point next to Gold-dust Isle. The flood comes from the westward, about 1 knot, or at times 2 knots, an hour. With the ebb it is nearly slack water, or perhaps there is a slight tendency towards the West: and such appears to be the case all along this coast from Christmas Sound.—*Capt. King*, p. 421.

vessels would, of course, be more confined, and no vessel above 500 tons should attempt to enter Christmas Sound. The *Beagle* lay moored in perfect safety here, but her chain cables became entangled with the rocks, and were not hove in without much difficulty and delay.

WATERMAN ISLAND, which forms Christmas Sound, is soon known by the remarkable heights at its South part. The southernmost was named by Capt. Cook, York Minster. "This lofty promontory, viewed from the situation we were now in, terminated in two high towers; and within them a hill shaped like a sugar-loaf. This wild rock, therefore, obtained the name of *York Minster*." Capt. King says (1830), "I fancied that the high part of the Minster must have crumbled away since Cook saw it, as it no longer resembled 'two towers,' but had a ragged, notched summit, when seen from the westward."

York Minster.—"The promontory of York Minster is a black, irregularly shaped, rocky cliff, 800 ft. in height, rising almost perpendicularly from the sea. It is nearly the loftiest, as well as the most projecting part of the land about Christmas Sound, which, generally speaking, is not near so high as that further West, but it is very barren. Granite is prevalent, and I could find no sandstone. Coming from the westward, we thought the height about here inconsiderable; but Cook, coming from the South Sea, called them 'high and savage.' Had he made the land nearer the Barbara Channel, where the mountains are much higher, he would have spoken still more strongly of the wild and disagreeable appearance of the coast."—*Capt. King.*

Capstan Rocks are 8 miles West of York Minster, and 5 miles from Point May. They are about 20 ft. above water. There are no other dangers to seaward of a line from York Minster to the Philip Rocks. These lie off Cape Alikhoolip, and are dangerous, though above water, because so far from shore, and so low.

COOK BAY is the large space between Waterman Island and Cape Alikhoolip. Broken land, islets, and breakers, surround and make it unfit for the approach of vessels. The entrance to the Beagle Channel (page 62) is in its N.E. part.

Treble Island, 6½ miles N.W. from Philip Rocks, is remarkable, having three peaks, visible from a considerable distance. Near it are some straggling rocks.

Gilbert Isle (or rather Islands), on the opposite side, was so named by Cook, from his master. It is nearly of the same height with the rest of the coast, and shows a surface composed of several peaked rocks, unequally high. At the north-eastern side of the eastern Gilbert Isle is *Doris Cove*, a safe anchorage for a small vessel. To the West of the western island are the *Nicholson Rocks*, northward of which is Adventure Passage, clear of danger.

Cape Castlereagh, the western end of the Stewart Islands, is a high and remarkable promontory. North of it is an excellent anchorage, Stewart Harbour, which, having three outlets, may be entered or quitted with any wind, and without warping. Wood and water are as abundant as in any other Fuegian

harbour. The general depth is 6 to 12 fathoms, the greatest 16 fathoms. Two rocks, just awash at high water, lie nearly in the middle ; and a rock, on which the sea breaks, lies 1 mile W.S.W. of the middle opening to the harbour. These are the only dangers.

Cape Desolation is the next promontory in passing along the coast. It was so named by Cook, "because near it commenced the most desolate country I ever saw." It is the South point of Basket Island. It is very remarkable, rugged, and with many peaks. Eastward of it is the large space of water called *Desolate Bay*, abounding with rocks and breakers.

Leading north-eastward from the cape is *Brecknock Passage*, which Capt. King prefers for entering or leaving Barbara Channel (to or from the Strait of Magalhaens), rather than by passing Fury Rocks.

Camden Isles.—*London Island* is one of a large group, called the Camden Islands. At its S.E. end is a safe anchorage, called *Townshend Harbour*. The *Horace Peaks* point out its situation. Some rocks, on which the sea breaks violently, lie off the islands, and near the entrance of *Pratt Passage*. As there are no soundings in less than 50 fathoms after passing these rocks and getting into the passage, you must depend on the wind lasting to carry you into or out of the harbour. The holding ground is excellent in it; and, though you have tremendous squalls off the high land to the westward, there is no fear of an anchor starting.

The Furies.—Between London Island and Fury Island is the entrance of the Barbara and Cockburn Channels. Rocks show themselves in every direction ; the two clusters called *East* and *West Furies* being the most remarkable, and these, with the others, are much frequented for fur-seal at times. The situation of these rocks is accurately given on the chart, but no vessel should attempt to pass them without daylight and clear weather ; she must sail more by a good eye at the mast-head than by any chart.

Fury Island lies on the North side ; on its South side is *Fury Harbour*, a bad place, unfit for any vessel. At its North side is a perfectly safe and snug anchorage, called North Cove, fit only for small vessels.

BARBARA CHANNEL.—The western entrance to Barbara Channel is pointed out by four remarkable mountains. The *Kempe Peaks* are high, and show three points. The *Fury Peaks* are high and divided. *Mount Skyring* is most barren, high, and has a single peak.* *Mount St. Paul* is similar to, and,

* Mount Skyring is on the East end of the largest of the Magill Islands. It was ascended in the course of the survey (May, 1829). Lieut. Skyring says:—"We gained the summit after three hours' hard travelling. During the last 500 ft. of the ascent the mountain was almost precipitous, and we had the utmost difficulty in passing the instruments from hand to hand. Its formation is remarkable, although, I believe, the same structure exists throughout the hills around. The base is a coarse granite, but this solid formation

in one view from near Fury Island, appears very like the dome of the cathedral whose name it bears.

Lieut. Skyring (H.M.S. *Beagle*) says :—" From a summit on Bynoe Island an extensive view was obtained of the islands in Melville Sound, as well as of the entrance to the Cockburn and Barbara Channels. Such a complicated mass of islands and rocks I never before saw ; to lay them all down correctly would occupy a long time. Sufficient, however, was done to take the navigator through this labyrinth ; but I am well aware that very much is wanting to complete the survey." The chart must be referred to as the best guide. For small vessels there is neither danger nor difficulty, and there are numerous anchorages they may reach without trouble.

In Cockburn Channel the flood tide sets to seaward, but it was not found to be of consequence to a vessel in working through. The rise and fall are not more than 6, or at most 8 ft., at spring tide.

Between Kempe Island and Noir Island is the *Milky Way*, a span of sea in every part of which rocks are seen just awash with, or a few feet above, the waters ; on them the sea continually breaks. It is not advisable to pass inshore of these. No chart or directions can guide any vessel here. The same observation applies to the space as far as Cape Schomberg, on London Island ; daylight and a good look-out can be the only guides.

NOIR ISLAND is moderately high, about 600 ft., having a remarkable neck of land to the S.W., ended by a rock like a steeple or tower. One mile South of this point is a sunken rock, over which the sea occasionally breaks ; two other breakers are in the bight close to the point. The island itself is narrow and long, apparently the top of a ridge of mountains, and formed of sandstone (perhaps clay-slate), which accounts for the bottom near it being so good, and for the needle-like appearance of the rocks at the West end, as the sandstone, being very soft, is continually wearing away by the action of the water. It is the resort of large flocks of penguins.

There is an excellent roadstead under the East side of Noir Island. Several ships may lie there, secure from all winds between North and South by West, over clear sandy bottom. Wood and water are plentiful, and easily obtained. There is a cove at the South part of the island, where boats would be perfectly safe in any weather, but the entrance is too narrow for vessels of any kind.

Tower Rocks, two in number, 1½ mile apart, are steep-sided, high, and steep-to ; a ship may pass close to them. They lie 7 miles S.S.E. of Noir Island.

All the space between Noir Island and the coast is extremely dangerous for

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cannot be traced half the height ; above is an immense heap of masses of rock, irregularly and wonderfully thrown together, many loose fragments overhanging with apparently very little hold. This station was the most commanding we had chosen during the survey. A document referring to the survey was deposited on its summit."

shipping, being scattered over with very numerous rocks; still there is room to go round Noir Island, and a vessel need not fear being hampered by an East wind, in the event of anchoring there.

Agnes Islands and *Stokes Bay* do not require description. No vessel ought to entangle herself in these labyrinths; in thick weather she would be in a most precarious situation.

Grafton Islands, which follow next in succession, are high, and similar in character to the rest of the coast. *Wakefield Passage*, behind them, has been used by a sealer, and the land beyond is broken into islets and rocks. The islands extend about 20 miles in a N.W. direction from Isabella Island to Cape Gloucester. Between them are several anchorages, but the best is Euston Bay, between Ipswich Island and Isabella Island. *Hope Harbour*, at the East end of the group, is one of those formerly used by the sealers.

Euston Bay is one of the best anchorages on this coast; one which can be approached and left with any wind, without risk, and in which a fleet might lie in perfect security from all but the S.E. winds, the least prevalent of any on this coast. Cape Gloucester (presently described) is a guide to it. Passing this cape from the northward, you see a high island to the S.E., distant 7 miles, this is Ipswich Island; rounding this, you must give a good berth to the sunken rocks, 1 mile from the S.E. extremity, upon which the sea generally, but not always, breaks. After clearing them, pass close to Leading Island, and steer for the opening of *Laura Basin*, which you will see under a high, peaked mountain, and choose your berth by the eye. A large patch of kelp across the mouth of the harbour was carefully examined; the least depth found was 4 fathoms. Laura Basin has water enough for a frigate, but is better suited for a small vessel; large ships should anchor in the bay.

No place could be more convenient than this for such purposes as wooding and watering. Water casks can be filled in the boat, in perfectly smooth water, and wood cut close to the water's edge.

CAPE GLOUCESTER is a very remarkable promontory, and cannot be mistaken. At a distance it appears to be a high, detached island; but on a nearer approach a low neck of land is seen, which connects it with Charles Island, the largest of the Grafton Islands. A rock (on which the sea breaks) lies nearly 1 mile to the N.W., and is the only danger. The cape is steep-to, and may be passed quite close. The land is very mountainous, rocky, and barren, spotted here and there with tufts of wood.

Breaker Bay lies between Cape Gloucester and the Fincham Islands. "A worse place for a ship could scarcely be found; for, supposing thick weather to come on when in the depth of the bay, she would have lurking rocks and islets just awash with the water on all sides of her, and no guide to take her clear of them, for soundings would be useless, and in such weather the best chart that could be constructed could not help her. The land at the bottom of the bay appeared to be distant, and much broken. Indeed, from the Week

Islands to Cape Gloucester (and thence to the Strait of Le Maire) there is an almost innumerable succession of islands and rocks, without any continued tract of land, so that channels might be found in all directions, valuable, no doubt, to Fuegians in their canoes, but not often to seamen in ships, or even to sealers; for, where the natives go with their canoes, seals are never found in any numbers."

Fincham Islands form the N.W. point of Breaker Bay or Coast. There are many islets and rocks near. There is no good anchorage, and the coast is very dangerous and unfit to be approached.

Deepwater Sound runs into the land N.E. of Fincham Islands, and ought to be avoided.

Cape Tate is the extremity of a mountain, the S.E. point of Otway Bay. It is rather high, and rounded at the summit; off it, to the North and West, lie *College Rocks*. Those nearest the cape are also nearest the track of a ship running along the land; and half a mile West of them lies a detached and dangerous rock, under water. The sea generally breaks on it.

OTWAY BAY is the space comprised between *Rice Trevor Islands*, of which Cape Tate is the S.W. extreme, and Landfall Islands to the North. It is an extensive space of water, surrounded by broken land, islets, and rocks. Many of the latter are scattered about, and render it unfit for a vessel. It is probable that more than one passage exists hereabouts leading from Otway Bay to the Strait of Magalhaens, as deep inlets run in that direction as far as the eye can reach. In 1871 a sealing vessel, commanded by Don Pedro Louis Bueno, passed safely through the channel between Dynevor Sound and Long Reach, after vainly seeking for a passage through Cordova Channel.

Landfall Island was so named by Capt. Cook, in December, 1774. He made the land here on his return from his second voyage. There are two principal islands, separated by a narrow channel; they are high, and towards the sea are barren, but the sides of the hills, towards the East, are thickly wooded. *Cape Schetky*, the S.E. point, is a remarkable double-peaked height; some rocks, just awash, lie off it, distant 1 mile. *Cape Inman* (so named in compliment to the Professor), the western point, is high, with perpendicular cliffs, and almost detached from other land; so that a vessel, knowing her latitude within 5 miles of the truth, cannot fail to make it out, if the weather be tolerably clear. The sea breaks heavily on some rocks off the cape.

Latitude Bay, a good anchorage, though somewhat exposed to the swell thrown in by N.W. winds, lies on the North side of the larger island, at the East end of the opening which separates it from the smaller. The bottom shoals gradually from 20 to 5 fathoms, over fine sand, and is sheltered from West winds and others (except North). It is remarkably easy of access, and is also easy to leave—rather rare qualities in a Fuegian harbour. Cape Inman, being prominently situated, is a good guide to the harbour, which can be safely recommended as a good anchorage for shipping. Wood and water are

not to be found so close to the anchorage as in other Fuegian harbours, but they may be obtained with very little trouble, and in any quantity, by going up the passage between the islands to one of the many streams which run from the high land. There is plenty of water also, very near the best berth, on the South side; but frequently a surf breaks on that beach. The passage is also a snug berth for a vessel of less than 12 ft. draught. A vessel should not moor in less than 10 fathoms, as close to the West shore as possible, with an anchor to the eastward, in the event of the wind coming from that quarter.

Week Islands lie next to the N.W., and at their South side is a roadstead, with good holding ground in 18 or 20 fathoms, coarse gravel and sand, with patches of rock. It is exposed to southerly winds, and to those from the West; therefore it is not desirable for a vessel to anchor there. Between the islands is a snug berth for a small vessel, quite secure, but difficult of access.

The eye must be the chief guide in entering most of these places; they are of one description—inlets between high land, having generally deep water, with kelp buoying the rocky places. Flaws of wind, and violent gusts off the high land, render the approaches to them difficult, and, to a large ship, impracticable.

Cape Sunday is the western point of the Week Islands, and the S.W. of Graves Island; it is high and prominent. Two islets and two dangerous rocks lie off it.

Barrister Bay succeeds. It is an exposed place, full of islets, rocks, and breakers. "In sailing along the coast we passed inside of several breakers, and, I hope, noted all that lie in the offing; but we cannot be sure, for breakers on rocks which are under the surface of the sea do not always show themselves."—*Admiral FitzRoy.*

Cape Deseado is the next promontory. Three miles before arriving at it there is an opening, which probably leads into a good harbour behind a number of islands; then the coast is high and unbroken to the cape, which is the highest land hereabout, and is remarkable. A rocky islet lies more than 1 mile off shore.

Dislocation Harbour, 4 miles N.W. ½ W. from Cape Deseado, was so called by Admiral FitzRoy, from an accident happening here to Mr. Murray. It is a place of refuge for an embayed or distressed ship, but unfit for any other purpose; its entrance is rendered difficult to the eye by rocks, on which the sea breaks violently; and by two rocks under water, on which the sea does not *always* break. In this place water may be obtained very easily, as boats can lie in a fresh-water stream, which runs from the mountains. Wood is also plentiful. The harbour is large enough for four small vessels. The entrance is narrow, but all dangers are visible. It is much exposed to West winds and the westerly swell, which might for weeks together prevent a vessel from getting out to sea.

The situation of Dislocation Harbour is pointed out by the heights, called

Low and *Shoulder Peaks*; they are the most remarkable on that part of the coast, and immediately over the harbour. To find the entrance, steer for the peaks; look out for the *Weather* and *Lee Rocks*, both several feet above water, the sea breaking violently on them; and when within 4 miles of the shore, you will distinctly see the opening from the mast-head. In going in, avoid the two rocks at the entrance, and anchor in the innermost part; only a small ship can get out again without a fair wind.

To the N.W. of Dislocation Harbour is *Chancery Point;* and hence to Cape Pillar, at the entrance to the Strait of Magalhaens, the land appears high and mountainous; southward it seems lower and more broken. Off the shore here lie many rocks, on which the sea breaks violently, besides the two clusters called the *Judges*, which lie off Chancery Point, and the *Apostles* or *Apostle Rocks*, a little South of Cape Pillar. A dangerous rock, under water, on which the sea breaks, lies half a mile more to the North than either of the Apostles. Some of these rocks are from 5 to 50 ft. above the water, but many breakers show near them, indicating an extensive reef. The outer rock is 4 miles from the land.

CAPE PILLAR, previously described on page 47, is a detached headland, and so very remarkable, that no person can fail to know it easily. Close to the cape are two small rocks, called the Launches; they are not more than 3 cables' lengths from the shore. The cape and the shore on each side are steep-to. Off the cape, at 2 miles distance, there is 60 and 70 fathoms, fine sand.

CHAPTER III.

THE WESTERN COAST OF PATAGONIA, FROM THE STRAIT OF MAGALHAENS TO THE ISLAND OF CHILOE.

This portion of the South American Coast is a continuation of the singularly-broken and intersected land so characteristic of these regions. It was partially explored by Sarmiento, and also by the officers in the *Beagle*, in her surveying voyage; but even this latter is somewhat imperfect, and there are many vacancies to fill up before our knowledge of the coast is complete. This, however, is of the less consequence, inasmuch as it is likely it will be but very seldom visited, and then only by those engaged in particular pursuits.

The first notice of the intermediate coast between Tierra del Fuego and Peru was furnished by a vessel sent in 1539-40, from Seville, in Spain, by D. Gutierre de Vargas, Bishop of Placentia, under Alfonso de Camargo. Of the three vessels, one was wrecked in the strait, another returned to Spain without passing the strait, and one of the masts of the third was taken out and sent to Lima, where it was for many years preserved as a curiosity.—(Herrera, 6, 10, &c.)

The climate of the coast of Western Patagonia, described in this section, is cold, damp, and tempestuous. The reigning wind is N.W.; but if it blows hard from that quarter, the wind is very liable to shift suddenly round to the westward, and blow a heavy gale, which raises a mountainous cross sea. These westerly gales do not generally last long, but veer round to the southward, when the weather, if the barometer rises, will probably clear up. Should they, however, back round to the N.W. again, and the barometer keep low, or oscillate, the weather will doubtless be worse. Easterly winds are of rare occurrence—they are accompanied by fine clear weather; but westerly winds bring with them a constant fall of rain, and a quick succession of hard squalls of wind and hail.

Should a vessel be near the coast during one of these northerly gales, it would be advisable for her to make an offing as quickly as possible, to guard against the sudden shift to the westward that is almost certain to ensue. The discovery, however, of the anchorages of Port Henry, Port Santa Barbara, Port Otway, and St. Quentin's Sound, has very much reduced the dangers of the lee shore;

and a refuge in either of them will always be preferable to passing a night on this coast in a gale of wind.

The barometer falls with northerly and westerly winds, but rises with southerly. It is at its minimum height with N.W. winds, and at its maximum when the wind is S.E. The temperature is rarely so low as 40°, excepting in the winter months.

During the seven months, October to May, 1879-80, H.M.S. *Alert* was in the neighbourhood of Trinidad and Concepcion Channels, the wind was almost constant from North to West, and accompanied by rain, the average fall being 11 hours out of the 24. The direction of the wind is, however, altered in the channels, and nearly always blows down them from the northward; thus, a W.N.W. wind in Trinidad Channel becomes a North wind in Concepcion Channel. Gales were frequent, sometimes violent, and always came with squalls and thick weather; breaks of fine occur sometimes, but they are rare and short. The barometer is a useful guide, but its changes often accompany rather than foretell the changes of weather. A steady barometer, whether high or low, is a better indication of fine weather than a high unsteady glass. The mean height of the barometer for the seven months was 29·79. Thunder and lightning are rare, and are sure indications of rain when they do come.

At the conclusion of the first chapter (page 48, and also page 78), we have given a description of the western entrance to the Strait of Magalhaens, between Cape Pillar on the South and Cape Victory on the North. Off the entrance is the excellent leading mark formed by the Evangelists, or Isles of Direction, very clearly indicating the opening of the strait (p. 45).

The following descriptions are principally drawn from those of Captains P. P. King, Stokes, and Skyring, and Mr. Kirke, mate of H.M.S. *Beagle*, with which is incorporated the information gained from the later examinations made by vessels of the British, Chilian, and other navies. A work published annually by the Chilian Government, "Anuario Hidrografico de la Marina de Chile," contains much valuable information as to new surveys, &c.

Between CAPE VICTORY and Lord Nelson Strait the coast is very much broken, and intersected by channels leading between the islands of *Queen Adelaide's Archipelago;* on the sea coast of which, 10 miles N.N.E. of Cape Victory, is a remarkable pyramidal hill, called *Diana Peak*, 3,350 ft. high, which, in clear weather, is visible to ships entering the strait, at 30 miles off. *Lecky Monument*, about 11 miles N. ¼ W. from Cape Victory, is described by Lieut. Lecky, in 1874, as a remarkable isolated, pillar-shaped mountain, 3,600 feet high, forming a conspicuous land-mark when approaching Magalhaens Strait from the northward. *Cape Isabel* is a steep, rocky promontory, of great height, with a peaked summit, and a sharply-serrated ridge, having at its base two detached columnar masses of rock. *Beagle Island*, lying off it, is wall-sided; but, although tolerably high (about 450 ft.), is much lower than the land of the cape.

Cape Santa Lucia may be distinguished by a portion of flat table-land, about one-third of the altitude of the mountain from which it proceeds, and terminating at its outer face with a perpendicular precipice.

The coast between Capes Isabel and Lucia is dangerous to approach nearer than 10 miles, for there are within that distance many sunken rocks, on which the sea only occasionally breaks. Some of these breakers were seen to seaward at the distance of 5 or 6 miles, as Capt. Stokes proceeded along the coast. When he was off Cape Sta. Lucia, whales were very numerous.

The general aspect of this portion of the coast is similar to that of the most dreary parts of the Magalhaenic regions—bare, rugged, rocky, and mountainous, intersected by inlets, and bordered by islets, rocks, and breakers.

Cape Sta. Lucia is the westernmost point of *Cambridge Island*. *Cape George*, 1,000 ft. high, at the South end, is lower, and forms a bluff point, with some detached rocks at its base. *Lecky Look-out*, the central peak of Cambridge Island, is about 3,800 ft. high, and from its superior height to that of any other mountain in the vicinity, is a good mark for ascertaining a ship's position.

San Blas Channel, *Duck* and *Duncan Harbours*, *Duncan Rock*, and other rocks off them, are inserted in the survey from the oral information of the master of an American schooner, and probably are very incorrectly laid down. *Augusta Island* and the *White Horse* were seen by Lieut. Skyring.

CAPE SANTIAGO is the South end of Madre de Dios Archipelago; it is correctly placed, as are also the parts of the land that are particularised, viz., the opening of *West Channel*, *April Peak*, *Tower Rock*, and the bay to the eastward of it, *Horn Peak*, conspicuous when seen from the N.W., and *Cape Three Peaks*, which is the South point of the entrance of the Gulf of Trinidad. West Channel is narrow, the sealers report it as full of islets and rocks, and unfit for general navigation. Southward of April Peak the land has a different appearance from the shores of Trinidad Channel, being nearly clear of vegetation, and of a light gray colour. This is remarkable from seaward, and is a good guide when closing the land from the westward.

From *Cape Hawkesworth*, on the opposite side of the bay to April Peak, the coast trends N.W. 4½ miles to Rugged Head, and thence 3 miles N.E. to Arragon Island, at the entrance to Port Henry, the coast between being fronted by low islets and rocks extending 3 miles off shore, and should have a wide berth given it.

The GULF of TRINIDAD, with Trinidad Channel, separates Wellington Island from Madre de Dios. Trinidad Channel was surveyed by the officers of H.M.S. *Alert*, 1879-80, and the following description is chiefly taken from the remarks of Capt. Sir G. Nares, Capt. Maclear, and Nav.-Lieut. Petley, in charge of the survey.

The frequent tempestuous weather and heavy seas experienced off the western entrance to Magalhaens Strait, render the entrance into the Pacific by that

route at times difficult, even for vessels of great steam-power. The weather and the sea in Trinidad Channel and its offing, 160 miles to the North of Magalhaens Strait, are generally more moderate, and hence it offers a favourable route for vessels proceeding into the Pacific Ocean, when the other cannot be advantageously used. It is also an excellent channel by which to pass out to the Pacific for vessels that do not like the delay occasioned by the English Narrows in Messier Channel.

The channel is 38 miles long from Primero Point, the South extreme of Corso Peninsula, to the eastern end of Caffin Pass; it is clear, with deep water, and high hills along the southern shore, while low land and clusters of islands mark the northern side. The western entrance of the channel has from 17 to 40 fathoms, hence there is often a short rough sea even in fine weather. Inside the water is deeper, and generally the swell does not come beyond Cape Candelaria. The South shore is cut into by several fiords, most of which are deep. The North shore is low and wooded, but at the distance of 1 or 2 miles inland high hills arise. On the South side the characteristics are rugged pinnacles and hills, gray from the large masses of limestone exposed.

It should not be entered from the Pacific in the dark, or in thick weather, when the high land on each side cannot be distinguished, because of the many outlying shoals and rocks off Corso Peninsula, the sea sometimes breaking 4 miles from the land.

Rugged Head, formerly known as *Cape Three Peaks*, or *Tres Montes*,* is a detached mass of rock of a pyramidal form, lying at the base of the Tudor Range, and not easily made out from the westward; from North or South it appears as a round-topped island, and may be further recognised by a peculiar mass of rock, resembling a shoe, on the slope of Tudor Range.

PORT HENRY is a valuable, but somewhat confined anchorage, fit for vessels wishing to anchor for a night when the weather is fine, but when stormy the williwaws are severe, and a heavy swell sets into it. It extends in a southerly direction for 2 miles, and is from $1\frac{1}{2}$ to 3 cables wide. From the eastward Seymour Islands, a low group of wooded islets and rocks lying on the East side, and Arragon Island, a round grassy mound, 120 ft. high, on the western side, sufficiently mark the entry. From the westward it may also be

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* The discovery of this land is thus described by Sarmiento:—"March 17, 1579. In approaching the shore we saw a great bay and gulf, which trended deeply into the land towards some snowy mountains. To the South there was a high mountain with three peaks, wherefore Pedro Sarmiento named the bay 'Golfo de la Sanctisima Trenidad.' The highest land of the three peaks was named 'Cabo de Tres Puntas o' Montes.' This island is bare of vegetation, and, at the water-side, is low and rugged, and lined with breakers; on the summit are many white, gray, and black-coloured portions of ground or rock. Six leagues to the North of Cape Tres Puntas is the opposite side of the gulf, where it forms a large high mountain, backed to the North by low land, and fronted by many islands. This high mountain, which appears to be an island from the offing, was called Cabo Primero."

distinguished as being the first opening East of Rugged Head. The white sand between Maple and Parr Points on its eastern shore is also conspicuous. It is the first sand beach seen on the South shore after entering the channel, with a lowish sandy cliff at the back, and a round, rocky, and wooded mount at its western end. When off the port the *Organ Pipes*, a sharply-serrated ridge 2,329 ft. high, at the head of Aid Basin, are a good guide.

Anne Breaker, W. by S. half a mile from the N.W. point of Seymour Islands, is a most dangerous rock, being unmarked by kelp, and in ordinary weather seldom breaking. Rugged Head, seen open to the westward of Arragon Island, S.S.W., will keep a vessel to the northward of Anne Breaker, and the 5-fathoms rock 1 cable N.N.W. from it. *Sentry Islet*, a bare rock, 10 ft. high, is the northern islet upon the West side of the entrance. Its eastern side is steep-to, but foul ground extends 2 cables to the north-westward. *Low Island*, resembling Sentry Islet, is slightly higher. A dangerous rock lies N. ¼ W. about a cable from it; and another, having 4 fathoms on it, lies E. by S. ½ S., distant a quarter of a cable. *Kelly Rock* has 7 ft. water and 7 to 9 fathoms close around, and with a patch of coral, having 4 fathoms water on it, lying N.N.W. 1 cable from it, form the outer dangers in Howard Bay, on the eastern side of the entrance. Foul ground extends over the whole space inshore of them.

When off Port Henry, with the Organ Pipes bearing S.W. by S., Harbour Peak, a cone 1,640 ft. high, connected at half its elevation with a loftier range, will be seen, also the sandy beach mentioned above. Keep Rugged Head open of Arragon Island S.S.W. until Harbour Peak is in line with the East extreme of the sand beach S.E. ½ S., which leads in mid-channel till Low Island bears W.S.W., when alter course S. by W. into the anchorage, which is in from 7 to 14 fathoms, sand, fair holding ground. The best situation is with Low Island, N. by W. ¼ W.; Maple Point, N.E. ½ N.; and Observatory Rock, W. by N. ¾ N.

Aid Basin, the continuation of Port Henry, to the southward, is a completely landlocked harbour, with anchorage in 15 to 24 fathoms, soft mud, but the entrance, between Jane Island and Bluff Peninsula, is only 60 yards wide; a ledge, with 4 fathoms over it, extends across, and on the northern side lie two sunken rocks nearly a cable apart; the eastern rock lies about one-third of a cable, and the western rock within a few yards of the shore. None but a small vessel could use this channel. There is a lake of excellent fresh water at the head of the basin, and abundance of wood.

It is high water, on full and change, in Port Henry, at noon; springs rise 6 ft., and the stream is not appreciable.

From Seymour Islands the coast trends easterly for 2 miles to Wolsey Sound, and is fronted by numerous rocks extending nearly 2½ cables off shore. *Three Peaks Mountain*, 2,310 ft. high, the northernmost of *Eastern Peaks*, rises abruptly from the coast, and is wooded nearly to the summit, which is of

dark bare rock with three distinct peaks, the northern peak being lower than the other two. These peaks, being conspicuous, afford an excellent mark to the navigator.

Wolsey Sound is a deep fiord 3 miles long in a southerly direction, and about half a mile wide. At 1½ mile East of Wolsey Sound lies the entrance to Cranmer Sound; these sounds are connected on the South side of Latimer Island by a channel having in it numerous islets and rocks, among which indifferent anchorage can be obtained. There is no ship passage into Cranmer Sound from Wolsey Sound, nor anchorage within it if entered from the northward. To enter Wolsey Sound, pass midway between Fisher Island and Cape Cardinal. A rocky islet lies S.S.E. 1 mile from the entrance, in the middle of the passage joining the two sounds; pass between this islet and the S.W. point of Latimer Island, off which a shelf extends half a cable, and anchor close under the South shore of Latimer Island in 9 to 17 fathoms, rocky bottom.

Port Rosario, 4 miles eastward of Wolsey Sound, affords but a very indifferent anchorage; it is about half a mile in extent, with general depths of 19 to 25 fathoms. The port will be recognised by two islands, respectively 300 and 500 ft. high, shaped like limpet shells, and wooded to their summits, which lie to the north-westward of the anchorage. Off the northern island is a small bare rock, 10 ft. high, against which the swell breaks furiously. The entrance is 1½ cable broad, and lies between Baker Islets and Peach Rock, 4 feet high, black and jagged, with a patch of kelp having 12 ft. water, 2 cables within.

Eastward of Port Rosario are *Hernando Islands*, a group of islands and rocks lying in the entrance of *Lamero Sound*, among which the *Alert* found no good anchorage. The sound extends 7 miles to the S.E., and appears to end in a chain of shallow lakes. *Pilot Island* rises to 1,608 ft. in height. *Cape Candelaria*, 520 ft. high, its North extreme, from the eastward or westward appears as a conical hill wooded at the base only.

Puerto del Morro, 1 mile S.S.E. from Cape Candelaria, and formed by an indentation in the Pilot Island shore and Grant Island, is about a mile in extent N.E. and S.W., 1 to 2 cables wide, with depths of 6 to 19 fathoms, bottom chiefly mud. This port, the only safe anchorage upon the South shore for a large vessel between Tom Bay and Port Henry, although convenient in fine weather, is exposed to fierce williwaws in bad weather. The most sheltered position is in 13 fathoms, sand and rock, with the West extreme of Grant Island S.E. ½ S., and the N.W. point N.E. ¾ N. The northern entry, though only half a cable wide, is the best, and has not less than 6 fathoms; it will be seen open when bearing S.W. by W. It is high water, on full and change, at $11^h\ 45^m$; springs rise 5 ft., and no stream is felt.

Between Pilot Island and *Coppinger Peninsula* to the eastward is an opening 3 miles wide, in the middle of which are *Division Islands*. Their North point, *Cook Point*, can be passed at a cable distant. About midway between Cook Point

and Carson Point of Pilot Island, and three-quarters of a mile W. ¼ N. from the former, is *Fairway Patch*, of 20 ft., with deep water around it, of small extent, and with but little kelp. To pass between it and Cook Point, keep Gordon Hill open West of Division Islands S.W. by S. ¾ S. till Cook Point bears East.

Cockle Cove, an inlet of Pilot Island, and 3 miles South of Cape Candelaria, is unfit for vessels drawing more than 15 ft. water, or more than 170 ft. long, but for these it affords a snug retreat, secure to a great extent, from the williwaws. It is, however, a long way out of the main channel, and, as it is necessary to moor, is of little use as a stopping place for a single night. To enter it, avoid the reef extending S.E. by S. 1½ cable from Henby Islets by leaving it to starboard. The entrance, between two wooded islets 40 ft. high, will be seen bearing S.W. ¾ W. Steer in between these islands, named North and South Gate, alter course to S.S.W., and pass mid-channel between Centre Island and the North shore. The channel has a depth of 5 fathoms, but is narrow, and requires careful navigation. Moor in 6 fathoms, soft mud, with Observatory Islet, shut out by Centre Islet, N.E. by E. ½ E.; at half a mile South of the anchorage is a boat passage leading into Lamero Sound. With the exception of these two ports there is no fit anchorage around Division Islands.

It is high water, on full and change, in Cockle Cove, at $11^h\ 45^m$; springs rise 5 ft., and no stream is felt.

Ancon del Sudueste, on the East side of Coppinger Peninsula, is deep, with no anchorage but for very small vessels. *Delgado Sound*, dividing Coppinger and Brazo Peninsulas, is fronted by a group of low islets and rocks, named *Redbill Islands;* at their western end is *Webster Rock*, of 4 ft., in the fairway of Delgado Sound, with deep water around it, and only slightly marked by kelp. In continuation eastward of these islets are some others off the N.N.W. part of Brazo Peninsula, *Rice Rocks*, above water, being about a third of a mile off shore. *Pan de Azucar*, a sugar-loaf hill, 880 ft. high, marks the West side of the entrance to Delgado Sound. At the head of *East Bay*, a narrow inlet extending 3 miles eastward from Delgado Sound, is Stowaway Cove, where the *Alert* remained in quiet during a week of exceedingly bad weather. The approach is narrow, and the anchorage, in 12 fathoms, soft mud, confined; but, if a hawser be made fast to the shore to prevent swinging, no inconvenience will be felt.

Medio Island, westward of Topar Island, is 150 ft. high, half a mile long, and thickly wooded. Two rocks, 3 ft. high, lie close off its South side, and at two-thirds of a mile S.E. by E. from the S.E. point is *Gunn Rock*, with 7 ft. water, well marked by thick kelp. Between Delgado Sound and *Brazo Ancho Point*, at the East end of Brazo Peninsula, there is no anchorage or shelter for ships. Vessels should pass southward of Gunn Rock and Medio Island, and if

thick and misty it is advisable to close the coast of Brazo Peninsula, which is free from danger.

Topar Island is 2,150 ft. high, the summit being a bare rocky table top. The shores are generally free from reefs and outlying dangers, but afford no anchorage. Moreton Island, lying half a mile off the S.E. shore, is about 40 ft. high, and wooded; some rocks, well marked with kelp, lie N. by E. a quarter of a mile from it. *Caffin Pass*, leading from Trinidad Channel to Concepcion Channel, South of Topar Island, is 1½ mile wide, and very deep. *Iris Island*, lying half a mile East of Brazo Ancho Point, is a small grassy islet, 20 ft. high; two small rocks, 5 ft. high, lie 1½ cable S.W. of it.

Brassey Pass lies North of Topar Island, separating it from Wellington Islands. It connects Wide and Trinidad Channels, and is deep and free from danger. Between Cape Somerset, the S.E. cape of Wellington Islands, and Camel Island, 3½ miles farther West, are Hastings and Wilshere Fiords and Port Charrua, the two former having no anchorage. It is high water, on full and change, in Brassey Pass, about noon; springs run through the pass 1½ knot per hour. The flood makes to the eastward, and the ebb to the westward.

Port Charrua, 2¾ miles West of Cape Somerset, a convenient and sheltered anchorage, is easily recognised. It extends N.N.W. for 1½ mile, and three-quarters of a mile within the entrance is anchorage in 7 fathoms, mud. At the head of the inlet is a large waterfall, 434 ft. high, near which grow some large trees, fit for spars. The West shore is formed by lofty and precipitous mountains, over which the squalls pass without reaching the anchorage. Anchor with the East side of the cliff in line with Brown Point N. by W., Celery Island E. ½ S., and the small beach on the South shore S.W. ½ W. Two rocks, dry at low water, extend from the East shore half a cable into the anchorage.

Kathleen Anchorage, 3¼ miles W. by S. of Cape Somerset, is easily recognised by Camel Island, 1,380 ft. high. From abreast Emma Point, the N.E. extreme of Camel Island, the inlet runs in W. by S. ½ S., shoaling to 15 fathoms at 3¼ miles from the entrance, abreast an opening into Trinidad Channel. Vessels should not proceed above Skua Islet. The best berth is with Skua Islet bearing W. ½ S., and the East point of Seaward Entry S. by W., in 15 fathoms, clay, with rocks. The squalls are severe, but the water is always smooth, and the *Alert* held well on all occasions. *Seaward Entry* is narrow, and filled with kelp. Wood suitable for spars or for burning can be procured here.

From Cape Somerset to *Cordova Point*, 9 miles westward, the coast is broken by deep fiords between rugged ranges, about 3,000 ft. high; the most prominent is *Doublepeak*, or *Notre Dame Mountain*, formed by two snow-capped peaks, 3,433 and 3,610 ft. high, at the head of *Notre Dame Fiord*. *Petley Islands*,

lying nearly a mile South of Cordova Point, 80 ft. high, are wooded. From hence to the entrance of Brazo del Norte the coast was not examined.

Brazo del Norte is about 5 miles wide at its entrance; thence it extends in a N.N.W. direction with no apparent termination. The *Alert* proceeded 27 miles up this inlet, and found it perfectly open and clear. *Cathedral Mountain*, on the East shore, a conspicuous peak, 3,836 ft. high, resembling at a distance the spire and roof of a church, is usually hidden by clouds, but, when clear, is visible from a great distance. From the northern position reached by the *Alert*, the inlet appears to divide, the West arm running N.N.W., and the East arm N. by E. $\frac{3}{4}$ E. It is believed that this channel is connected with Fallos Channel. *Malaspina Islands*, an extensive group of islands and rocks, are situated at the western entrance of Brazo del Norte.

Neesham Inlet, to the N.N.W., is very small, and the bottom is too rocky to recommend its use as a harbour. The entrance is marked by Schweers Island, lying South of it, which can be passed on either side, but a rock, awash at low water, lies E.N.E. half a cable from the East point. In the basin between Skyring and Millar Points is 44 fathoms, sand; at $1\frac{3}{4}$ cable North of Adelaide Point, is 6 fathoms; but a hawser, to secure the vessel in mid-channel, will be required to Bollard Rock. The inlet extends $3\frac{1}{2}$ miles to the northward, ending in a small creek. The passages leading hence into Picton Channel are unfitted for ship navigation.

Van Islands, 3 miles in extent W.S.W. and E.N.E., near the centre of Trinidad Channel, lie 3 miles westward of Malaspina Islands, and form two distinct groups, with several rocky islets and sunken dangers between them. *Double Rock*, 10 ft. high, and several other rocks over which the sea breaks heavily, extend three-quarters of a mile W. by S. from the western island. If passing between Van Islands and *Ramses Islands*, to the northward, extreme caution is necessary, and the North shore of Van Islands should be kept not more than three-quarters of a mile distant.

Picton Channel, with an average breadth of $1\frac{1}{2}$ mile, extends in a N.W. direction for about 20 miles, with bold shores intersected by fiords on either side, and deep water in mid-channel. The western shore then becomes low, and dips gradually to the northward till it ends, 36 miles from Trinidad Channel, in an extensive area of rocks, islets, and disconnected breakers. At its northern end is a bar with only 7 to 10 fathoms water. This channel, from the dangerous nature of its seaward approach, is of no use to mariners passing through these seas.

ALERT HARBOUR, to the N.W. of the western Van Islands, is easy of access, with good anchorage and shelter; it would contain several large ships at single anchor. It is especially valuable to a vessel in distress, and is at all times to be preferred to Port Henry. The harbour is easily recognised by Castle Point, a steep, white limestone cliff, 150 ft. high, wooded on the summit.

Cone Hill, 416 ft. high, at the head of the harbour, being wooded, with a clear grassy patch on its eastern slope, forms a valuable leading mark.

In approaching the harbour, Castle Point N. by W. leads eastward of the *Challenger Breakers* up to the only entrance, between Fairway Rock, 30 ft. high, and a rock awash, lying three-quarters of a cable West of Black Rock. To avoid this danger, close Fairway Rock, taking care not to open Cone Hill eastward of Knocker Island, until Fairway Rock bears S.W., thence steer N.W. by N. for Feilden Point, to avoid a sunken danger which lies E.S.E. 1 cable from Button Island. There is good anchorage in 12 to 23 fathoms, mud, between Knocker Island and Currant Point, the holding ground improving towards the North shore. A good berth for a large vessel is with Fairway Rock S.E. ½ S., and the islet North of Feilden Point E.N.E. *Mackerel Anchorage*, at the head of the harbour, is a secure retreat for small vessels, being perfectly landlocked, with good holding ground.

It is high water, on full and change, in Alert Harbour, at $12^h\ 15^m$; springs rise 7 ft., and no appreciable stream is felt.

From Alert Harbour to *Cape Gamboa*, 3½ miles westward, the coast is much broken, and rocks under water extend, in some places, for 1 mile off shore. *Seal Rocks*, 5 ft. high, lying 5½ miles W. by S. ½ S. from Van Islands, are a dangerous cluster of rocks, extending 1¼ mile East and West, and three-quarters of a mile North and South. Three heads show above water, and always break; there are also two sunken dangers, which usually break, eastward of Seal Rocks, the eastern one being a mile distant from them. *Bossi Bight* is apparently shallow, and full of rocks and small bare islets. On its shores are several peculiar hills, like huge towers, thickly wooded.

Corso Peninsula forms the West shore of Bossi Bight, and is the North entrance point of Trinidad Channel. It is connected with Mornington Island by a low neck of land intersected with lagoons. *Mount Corso* has a smooth rounded summit, 1,420 ft. high, connected by a wooded range with several other hills, all conical in form; on the South side it slopes gradually down to a plain, ending in *Primero Point*, a long, low, shelving point, off which numerous islets and rocks extend 1 mile, with breakers 2½ miles S.S.E. This vicinity is exceedingly dangerous, and should be studiously avoided. The West side of Corso Peninsula is fronted by numerous rocks and islets; the outer breakers lie 4 miles off shore. *Cape Pakenham*, the western extreme of Mornington Island, is low and rocky, with a cluster of rocky islets off it. Its summit, *Spartan Cone*, is very conspicuous. Breakers were observed about 7 miles West of Cape Pakenham. As this portion of the coast has not been closely examined, strangers should be on their guard when approaching Trinidad Channel from the westward. The West coasts of Mornington and Campaña Islands have sunken dangers extending at least 12 miles off shore.

In making for Trinidad Channel from the westward, the land should not be closed nearer than the meridian of 76°, until latitude 49° 58′ S. is reached,

when the channel may be approached on that parallel till the peaks are recognised, when no difficulty will be found in entering.

Tides.—It is high water, on full and change, in Trinidad Channel, about noon; springs rise about 6 ft. The flood-stream runs to the eastward, and the ebb to the westward, the turn of the stream depending on the recent winds. South-westerly winds hold the flood up in both Trinidad and Concepcion Channels. The stream runs about half a knot per hour, excepting in Caffin and Brassey Passes, where it runs 1½ knot at spring tides. Off Cape Somerset there are tide ripples.

Cotopaxi Rock, discovered in 1875 by the Pacific Steam Navigation Company's ship of that name, lies about 15 miles N.W. from Mount Corso Island. It appeared to have 10 or 12 ft. water over it, but the weather was not suitable for exact observations. Other rocks of a similar character may exist in this little-known region, thus rendering extreme caution necessary in approaching the desolate coast. In all probability this rock does not break in fine weather.

Picton Opening and *Dyneley Bay* very probably insulate the land that separates them, of which *Cape Montague* is the S.W. extreme. There are some rocks 8 or 10 miles off the coast to the southward;* but between Cape Montague and Cape Dyer they are more numerous: several are 10 miles off the shore; many are dry, some are awash, and others show only by the breaking of the sea.

CAPE DYER is in lat. 48° 5′ 30″ S., long. 75° 33′ W. At 5 miles S.W. by W. ¾ W. from it is a rocky islet, about 45 ft. high, rising like a tower from the sea, called by Bulkely and Cummings, "*The Rock of Dundee*," from its similarity "to that island in the West Indies, but not so large; it lieth about 5 miles from the southernmost point of land out at sea." This rock is a good mark for *Port Santa Barbara*, from off which it bears S.W. ¼ S., distant 9 miles. At 1 mile to the North of the rock the depth is 23 fathoms, and gradually decreases on approaching Port Santa Barbara.

Port Santa Barbara.—The land about this harbour is similar to that about Port Henry. Its shores are rocky, with some patches of sandy beach, but everywhere covered with trees, or an impervious jungle, composed of dwarfish trees and shrubs. The land, in most places, rises abruptly from the shore to mountains, some of which attain an altitude of more than 2,000 ft., and are quite bare at their summits and on their sides, except in sheltered ravines,

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* Caution.—Several rocks have been recently discovered off the coast to the southward, viz,;—*Scout Rocks,* 10 miles S.S.W. ½ W. from Cape Santiago; two by the *Cordillera,* in 1872, 8 or 10 miles from shore, in lats. 50° 59′ and 51° 11′; also two by the *Magellan,* in 1874, one S.W. 2½ miles from Cape Sta. Lucia, and another S. ½ W. 12 miles from Cape Isabel.

where a thick growth of trees is found. These mountains, when specimens could be broken off, were found to be of basalt, with large masses of quartz imbedded in it; but on some parts of the shores the rocks were of very coarse granite.

In steering for the harbour, so soon as Cape Dyer bears South, by compass, you will be close to some rocks, which you should keep on your port hand. Abreast of this rock, one-eighth of a mile off, the depth will be 11 fathoms. The channel here is 1 mile wide, but gradually narrows on approaching the S.W. end of Breaksea Island; and at Wreck Point, the West head of the port, the width is about one-eighth of a mile. There are several rocks in this passage, but as the depth is from 6 to 8 fathoms, the anchor may be dropped, and the ship warped clear of them, in case of being becalmed; calms, however, are of rare occurrence here.

Breaksea Island,* more than 2 miles long, fronts the port, the heads of which are three-quarters of a mile apart. In the entrance of the port the depth is 3½ and 4 fathoms, and gradually decreases to 2½ fathoms, but at the bottom there is a basin with 6 and 8 fathoms in it.† This is a very good harbour, and affords the rare opportunity of anchoring your ship in a moderate depth, with easy access. It is also readily made out by its vicinity to Dundee Rock, which serves to point out its position.

It is high water here, on full and change, at $0^h\ 28^m$; springs rise 6 ft.

To the N.E. and N.W. of Breaksea Island are many straggling rocks. The *Beagle* having entered the port by the western entrance, left it by threading the rocks to the eastward, in doing which she had not less than 9 fathoms. Between the island and the mouth of the port, the depth is from 6 to 7 fathoms, good ground, which renders the entrance and exit very easy.

Flinn Sound is a deep opening to the eastward of the port; it was not examined. *Point Bynoe*, with the group of islands, Bynoe Islands, extending

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* "A large island, on the northern side of the harbour, is an excellent watering place, at which casks may be conveniently filled in the boats. It is also an object of great natural beauty. The hill which forms its western side rises to 700 or 800 feet, almost perpendicularly, and, when viewed from its base, in a boat, seems stupendous; it is clothed with trees, among which the light-green leaves of the winter's bark tree, and the red flowers of the fuchsia, unite their tints with darker foliage of other trees. This perpendicular part extends to the northward till it is met by the body of the mountain, which is arched into a spacious cavern, 50 yards wide and 100 feet high, whose sides are clothed with a rich growth of shrubs; and before it a cascade descends down to the deep face of the mountain."—*Capt. Stokes.*

† "In the afternoon we weighed anchor and warped into a berth in the inner harbour, where we moored in 3 fathoms. I found, lying just above high-water mark, half buried in the sand, the beam of a large vessel. We immediately conjectured that it had formed part of the ill-fated *Wager*, one of Lord Anson's squadron, of whose loss the tale is so well told in the narratives of Byron and Bulkely."—*Capt. Stokes, Voyages of the Adventure and Beagle*, vol. i., p. 165.

for 2 miles off it, is the West head of the Fallos Channel, which was explored for 30 miles without offering any interesting feature.

Fallos Channel probably communicates with the sea by Dyneley Bay and Picton Opening; and, beyond the latter, it is supposed to communicate with the Gulf of Trinidad by the channel to the West of Neesham Bay.

GUAIANECO ISLANDS, 20 miles in extent, are composed of two principal islands and many smaller islets; the westernmost is called *Byron Island*, and the easternmost *Wager Island*. They are separated by Rundle Pass, called in Bulkely's Narrative, the Lagoon; on the West side, and at the North end of it, is *Speedwell Bay*. There is a fair stopping place in the S.E. end of Wager Island; but, unless blowing very hard from the northward, it would be better for a ship to cross to Skyring Harbour.

Rundle Pass is only a quarter of a mile wide, but perfectly clear in the whole extent of its channel, excepting the northern entrance, where it is guarded by many detached rocks, which render the entrance to Speedwell Bay rather difficult. According to Byron's and Bulkely's Narratives, the situation of the wreck of the *Wager* is near the West end of the North side of Wager Island. Off the western and northern side of Byron Island are some rocky islets.

Guaianeco Islands are separated from the land of Wellington Island by a clear, but, in some parts, narrow passage. At its S.W. end it is contracted by rocks to 1½ mile, and at the South end of Byron Island is scarcely a mile broad; afterwards, however, it widens to 2½ and 3 miles.

The North point of Wellington Island is *Cape San Roman*, the West head of Messier Channel, which opens into Tarn Bay.

Tarn Bay is about 15 miles wide. In it *Ayautau Islands* lie 4 miles from the coast, but the interval is occupied by several rocky reefs, between which Lieut. Skyring thought there seemed to be a "sufficient clear passage." The pilot Machado, in 1769, however, thought differently.

The Channel's Mouth (Boca de Canales of the old chart) extends in a S.E. direction for 11 miles, and then divides into two branches, which are merely deep and narrow arms of the sea, running between steep-sided ranges of mountains. The shores are rocky, and afford neither coves nor bights, nor even shelter for a boat, and are perfectly unproductive; for no seals or birds were seen, and the shores were destitute even of shell-fish.

Cape Machado, in lat. 47° 27′ S., long. 74° 29′ W., is the North head of this opening. Two miles off it are two rocks, which Machado carefully and correctly describes, as he also does the rocks and breakers which extend off the South head for very nearly 3 miles. The *Beagle* twice occupied an anchorage under the Hazard Isles, in the entrance, and on both occasions was detained many days from bad weather, with three anchors down. She anchored here in June, 1828, and experienced the most horrible weather. Nothing could be more dreary than the scene around; and there is no doubt that the perilous

and arduous nature of the surveying service here hastened the sad termination of Capt. Stokes's existence.

Excepting this very bad and exposed anchorage, there exists none in the channel. Capt. Stokes describes it to be an extremely perilous anchorage. "The anchors," he says, "were in 23 fathoms, on a bad bottom, sand and coral. The squalls were terrifically violent. Astern, at the distance of half a cable's length, were rocks and low rocky islets, upon which a furious surf raged, and on which the ship must have been inevitably driven, if the anchors, of which three were down, had started."

Between Channel's Mouth and Jesuit Sound the coast is more unbroken and low than usual. In lat. 47° 17′ are some reefs, which project 2 miles to sea; behind them there was the appearance of a bight, which may afford anchorage. *Jesuit Sound*, like Channel's Mouth, is quite unfit to be entered by any ship.

Separated by *Cheap Channel* from the main is *Xavier Island*, the Montrose Island of Byron's Narrative. It is 11½ miles long, and 4 miles wide, and is very high, and thickly wooded with lofty trees. The only two anchorages which the islands afford are noticed and named by Machado—the northern one, *Port Xavier;* the southern, *Ignacio Bay*. The former is by far the better place, being secure from the prevailing winds, with 17 fathoms at 800 yards from the shore. The South end of the bay is a sandy beach, backed by tall beech trees. The shore to the South of Xavier Bay, for the first 4 or 5 miles, consists of a high, steep, clay cliff, with a narrow stony beach at its base, backed by mountains 1,200 or 1,400 ft. high, and covered by large and straight stemmed trees. The remainder of the coast, to Ignacio Bay, is low, and slightly wooded with stunted trees; and its whole extent is lashed with a furious surf, that totally prevents boats from landing. *Ignacio Bay* affords anchorage in 9 fathoms. The western coast of the island is lined by reefs, extending 2 miles off, upon which the sea breaks high.

Kelly Harbour is situated at the bottom of the N.E. corner of the Gulf of Peñas, in the bay formed between the land of St. Estevan Gulf and Xavier Island. It trends inwards in an easterly direction for 8 miles. The land about the harbour is high, rugged, and rocky, but by no means destitute of verdure. In the interior are lofty peaked and craggy ranges of snow-covered mountains. The points of the entrances are 2 miles asunder, N.E. ¼ E. and S.W. ¼ W., are thickly wooded, and low, compared with the adjacent land. Between them is a channel of from 35 to 40 fathoms deep, over mud bottom, without danger, to a cable's length of the rocky islets that fringe the shore for a quarter of a mile off.

On approaching the harbour the remarkably muddy appearance of the water is rather startling; but the discoloration proceeds only from the freshes of the river, and the streams produced from a very extensive glacier that occupies many miles of the country to the North. The course in is E.S.E. by compass, until in a line between the inner North point, and an inlet on the South shore

that is fronted by five or six wooded islets. Then haul up along the North side of the harbour, as close to the shore and as far as you please, to an anchorage. The best berth is in about 20 fathoms, when the two points of entrance are locked in with each other, and within 1½ cable of the sandy spit that extends off the western end of a high and thickly-wooded island. The ground is excellent, and so tenacious, that it was with difficulty that the *Beagle* lifted her anchors. Shelter, wood, and water, however, are the only advantages offered by the harbour.

For knowing Kelly Harbour the glacier is a capital leading-mark. It is a large field of ice, lying on the low part of the coast, about 2 miles to the northward of the harbour. The water at the anchorage, at half-tide, was perfectly fresh, but was too muddy to be fit for use.

SAN ESTEVAN GULF.—The entrance of this gulf, which is situated 9 miles northward of the N.E. end of Xavier Island, is 4 miles wide. *Forelius Peninsula*, on the western side, is a narrow tongue of land nearly 11 miles long. The entrance side of the gulf is a long sandy beach, curving round to the N.W. towards the entrance of the River San Tadeo, between which and Cirujano Island, forming the South (or rather the West) point of entrance, the width is less than 5 miles; and at 3 miles farther to the westward it is not more than 3½ miles across. Here, in the centre, there is a small islet called *Dead-tree Island.*

Beyond this is *St. Quentin's Sound*, 10 miles deep; and, at its N.W. corner, *Aldunate Inlet* extends in for about 8 miles. St. Quentin's Sound terminates in continuous, low land, with patches of sandy beach, over which, among other lofty mountains, the Dome of St. Paul's is seen. The shores are thickly wooded with shapely and well-grown trees; the land near the beach, for the most part, is low, rising into mountainous peaks a little distance in the interior, of which some are 1,500 ft. high, but they are not craggy.

San Estevan Gulf is one of the best harbours of the coast, being easy of access. The best anchorage is at about 2 miles above Dead-tree Island, in from 4 to 6 fathoms, sandy bottom. This will be at 2 miles from either shore, but the berth is perfectly land-locked; if necessary, anchorage may be taken up much nearer to it; and as in all parts of the sound there is anchorage depth, with a muddy or sandy bottom, the advantages offered to shipping would be of great consequence in parts of the world more frequented than the Gulf of Peñas. Whales were numerous, and seals were also seen.

With reference to a supposed passage through from San Estevan Gulf to the Chonos Sea, the result of a recent Chilian expedition entirely disproves the existence of one.

Cirujano Island, above-mentioned, is that on which the surgeon of the *Wager* was buried. The island is separated from the extremity of Forelius Peninsula by a strait, 1 mile to three-quarters of a mile wide.

The mouth of the *River San Tadeo* is easily distinguished on entering the

gulf, by the sand-hills on each side of its entrance, and the bearing of the East trend of Cirujano Island, S. by W. $\frac{3}{4}$ W. A sandy beach extends to the East and West of it for many miles; the land is low and marshy, and covered with stumps of dead trees. It has a bar entrance, much of which must be nearly dry at spring tides.

Purcell Island is separated from the land of Forelius Peninsula by a good channel, 2 miles wide; it is moderately high and thickly wooded, and about 6 miles in circuit. About mid-channel, and nearly abreast of the East end of the island, is a rock only a few feet above the water. The channel to the South of the rock is from 18 to 22 fathoms deep, and the bottom sandy.

Upon the peninsula, opposite the West end of Purcell Island, is an isthmus of low, sandy land, scarcely a mile wide; the one over which, it may be inferred from the narrative, the canoes in which Byron and his companions were embarked were carried.

The *Beagle* anchored in *Bad Bay* after dark, in 8 fathoms, sandy bottom. Of this place, Capt. Stokes remarks: "At daylight, we found that we had anchored in a small bay about half a mile off a shingle beach, on which, as well as on every part of the shore, a furious surf raged that effectually prevented our landing to get chronometer sights." The mouth of this bay is 28 miles N.E. from Cape Tres Montes, which, in clear weather, may be seen from its mouth. Like all this shore of the gulf, it is completely open to the S.W., and a heavy rolling sea.

Tres Montes Gulf.—To the westward, between Bad Bay and the land of Cape Tres Montes, is an extensive bight, 16 miles wide, and about 12 miles deep. The centre is occupied by a group of islands, called *Marine Islands*, upon which the *Sugarloaf*, a mountain 1,840 ft. high, is very conspicuous. It was seen from the *Wager* the day before her wreck. Upon the main, $5\frac{3}{4}$ miles N. $\frac{1}{2}$ W. from the Sugarloaf, is another equally remarkable mountain, called the *Dome of St. Paul's*, 2,284 ft. high.

Neuman Inlet, at the N.E. corner of this gulf, extends for 17 miles into the land, where it terminates; but it is of no use, as the water is too deep for anchorage. It is the resort of large numbers of hair-seals. At the N.W. corner of the gulf is *Hoppner Sound*, about 5 miles in extent. At its S.W. end is a deep inlet, extending 7 miles to the S.W., and reaching to within 2 miles of the sea coast, from which it is separated by an isthmus of low and thickly-wooded land. Capt. Stokes walked across it to the sea-beach, from whence he saw Cape Raper. The *Beagle* anchored at the bottom of Hoppner Sound, off the mouth of the inlet. The mouth of the sound is very much blocked up by the Marine Islands; but the southern channel, although narrow, has plenty of water. On the S.W. side of the Marine Islands is *Holloway Sound*, in which is Port Otway, an inlet extending for 5 miles into the land in a S.W. direction.

PORT OTWAY.– The entrance of Port Otway is on the West side of Holloway Sound, about 14 or 15 miles distant from Cape Tres Montes, and may be readily known by its being the first opening after passing the cape. Off the mouth are the Entrance Isles, among which is Logan Rock, having a strong resemblance to the celebrated rock in Cornwall whose name it bears. It is broad and flat at the top, and decreases to its base, which is very small, and connected to the rock upon which it seems to rest. Immediately within the entrance on the West shore is a sandy beach, over which a rivulet discharges itself into the bay. Here anchorage may be had in 9 or 10 fathoms. It is by far the most convenient one the port affords, and contains anchorage all over it, but the depth is generally inconveniently great, from 20 to 30 fathoms. Capt. Stokes says, in his journal :—" Among the advantages which this admirable port presents to shipping, a capital one seems to be the rich growth of stout and shapely timber, with which its shores, even down to the margin of the sea, are closely furnished, and from which a frigate of the largest size might obtain spars enough to replace a topmast, topsail-yard, or even a lower-yard. On each side of the harbour we found coves so perfectly sheltered, and with such inexhaustible supplies of fresh water and fuel, that we lamented their not being in a part of the world where such advantages would benefit navigation."—Vol. i., p. 170.

CAPE TRES MONTES is a bold and remarkable headland, rising from the sea to the height of 1,500 or 2,000 ft. It lies in lat. 46° 58′ 57″ S., and is the South extremity of the Peninsula of Tres Montes.

Capt. Stokes says: " At sunset Cape Tres Montes bore N.W. (*N.* 25° *W.*) distant 18 miles. In this point of view the cape makes very high and bold; to the eastward of it land was seen uninterruptedly as far as the eye could reach. We stood inshore next morning, and were then at a loss to know, precisely, which was the cape. The highest mountain was the southern projection, and has been marked on the chart as Cape Tres Montes; but none of the heights, from any point in which we saw them, ever appeared as ' three mounts.' The land, though mountainous, seemed more wooded, and had a less rugged outline than that we had been hitherto coasting since leaving the Strait of Magalhaens."

This was the northern termination of the *Beagle's* surveys in 1830.

Tides.—High water, at most parts of this coast, takes place within half an hour on either side of noon. The stream is inconsiderable, and the rise and fall rarely more than 6 feet.

THE INTERIOR CHANNELS AND SOUNDS.

The western coast of Patagonia, between the Strait of Magalhaens and the Gulf of Peñas, is formed by a succession of islands of considerable extent, the largest of which, Wellington Island, at the northern end, occupies a length of coast of 138 miles, and is separated from the main by Messier and Wide Channels; and from Madre de Dios by the Gulf of Trinidad. Madre de Dios, which is probably composed of several islands, has for its inner or eastern boundary the Concepcion Strait. Hanover Island has Sarmiento and Estevan Channels on its northern and eastern sides, and on the South is separated from Queen Adelaide Archigelago by Nelson Strait, which communicates by Smyth Channel with the Strait of Magalhaens.

These inner channels have risen into an importance, which was not foreseen by Admirals King and FitzRoy and the officers employed on the original survey of the Strait of Magalhaens. They have become the great highway for *steam* vessels passing from either ocean, as by this route they avoid the heavy sea to which the outer coast of Patagonia is liable. For sailing vessels, of course, they cannot be recommended. American mail steam-vessels of upwards of 4,000 tons have passed this way; and in the beginning of 1869, Admiral Cloué, the French commander-in-chief, took the frigate *Astrée* through without any difficulty; subsequently also Pacific Mail Steamers have used the inner channels.

From this new accession of interest it was found that the *Beagle's* surveys were not sufficiently minute to ensure safety, and in the autumn of 1866, Capt. R. C. Mayne, R. N., C.B., sailed from England in H.M.S. *Nassau* to complete the survey of the strait and of these inner sounds, a good service finished in 1869.

Through the whole extent of the channels the chart and eye must be the principal guides, as it is impossible to give a description of channels so narrow and tortuous with sufficient exactness to guide a mariner without them. Anchorages may always be had if judgment be exercised, and the vessel not pushed on till too late in the day to pick one up; and even should no anchorage be obtained, the shores, excepting in one or two places, are so bold and steep-to, that a vessel may safely remain under way all night.

SMYTH CHANNEL, which leads out of Sea Reach in the Strait of Magalhaens, as described on page 44 previously, is the entrance to this interior navigation. It extends in a N.N.W. direction for 45 miles, to Victory Pass, and then 30 miles W. by N. $\frac{1}{2}$ N. to Nelson Strait, which runs in from the Pacific to the South of Cambridge and Hanover Islands.

Cape Phillip, at its western entrance, has been before described on page 44, together with the anchorage of *Sholl Bay*, just eastward of it. At a little more than 6 miles from the cape, on the West shore, is the anchorage of *Deep*

Harbour, the entrance of which is a quarter of a mile wide. The anchorage, in 30 to 35 fathoms, is about half a mile within the first head.

Good's Bay, the next anchorage, is better than the last, the depth being from 20 to 25 fathoms. It is convenient for vessels going to the northward, but when bound in the opposite direction, North Bay will be better, from the depth being less.

Good's and North Bays are both unfit for long ships, as indeed are all the anchorages between Sholl and Otter Bays, and a vessel going northward should not pass Port Tamar or Sholl Bay without being sure of reaching Otter Bay.

Burgoyne Bay, 4 miles northward of Deep Harbour, and on the opposite shore, has anchorage in it, though it cannot be called good on account of its depth. The bottom was very uneven, varying from 40 to 12 fathoms, but near the shore in some parts anchorage might be had, with a stern hawser to a tree, and, as it is perfectly land-locked, there would be no danger in this. Hugh Head, a barren height, 200 or 300 ft. high over the North side of the bay, marks its entrance.

Pylades Bay, 2 miles to the northward, is about one-third of a cable wide; the anchorage at the head of the bay is sheltered from all winds except those from about West. *Antoine Bay* has no danger in it, but there is not room for anchorage, except by going to the head and making fast to the shore.

Passing Renouard Island, the course lies between Shoal Island and the eastern of the Evans group, between Richards and Simpson Islands, and then N.W. by N., so as to leave Pearse and Alert Rocks and Shearwater Islets on the starboard hand. Renouard Island may be passed on either side, but as Hull Islets block up the North end of the West passage, it is preferable to pass it to the eastward. From Cape Colworth until Otter Islands are approached there is no danger.

On rounding the West side of Shoal Islands give them a good berth, as the tide sometimes sets strong towards them.

Pearse Rock, lying 3 cables S.W. of Shearwater Islands, is small and awash, surrounded by kelp, and sometimes difficult to distinguish; a good berth should be given to it when passing.

Alert Rock, lying about 3 cables N.W. of Shearwater Islands, is similar to Pearse Rock, but has three heads showing above water, with a fringe of kelp round it, and it is difficult to distinguish when approaching it from the North.

If the weather be thick, and Alert Rock has not been made out, close the land North of Cape Colworth, or stop the engines until the weather clears. Nares Reach is open and free from dangers, with high land on both sides; Sparkes Islands in Retreat Bay on the western side, and Reid Island on the eastern side, being close to the shore, need no description. Mount Stone, Mary and Dashwood Points being easily distinguished, point out the way to Mayne

Channel. A rock was observed about 40 yards off Dashwood Point, which would be barely awash at half-flood.

Retreat Bay is large and well sheltered, but useless on account of its great depth; the same fault may be found with *Hose Harbour* on the opposite shore, where a depth of 50 fathoms is found within 2 cables of the land all round.

Tandy Bay, 3 or 4 miles to the northward, has anchorage for a small craft, and so also has *Oake Bay* on the opposite side of the channel, but with the far preferable anchorage of Otter Bay so near both are valueless.

Mayne and Gray Channels are separated by the Otter and Summer Islands. Of these Gray Channel is deeper than Mayne Channel, but narrower and more intricate; in fine weather, however, a vessel may, if necessary, pass through it in perfect safety by keeping clear of the kelp, by which all the dangers are marked.

Mayne Channel, about 8 miles in length, leading southward and eastward of Otter and Summer Islands, though the shoaler of the two, is the one which will be generally preferred by vessels not drawing more than 25 to 26 ft. For this channel the chart and a good look out for kelp will be sufficient guides. Northward of Summer Isles, Long Island should not be approached within three-quarters of a mile. Growing kelp extends at certain seasons of the year across the channel, and Capt. Latorre, of the Chilian corvette *Magallanes*, 1876, reports having obtained 4¾ fathoms where 5½ fathoms existed at the time of H.M.S. *Nassau's* survey, 1869.

A cylindrical *red buoy*, surmounted by a *globe*, is moored in 5 fathoms, on the northern edge of the ridge which extends from Summer Island to Long Island, and about 1 cable westward of the usual track for vessels. To avoid the shoal ground off the North end of Long Island, having passed the buoy, steer for Bavistock Peak until Cutler Island summit is in line with the gap in the hills made by Isthmus Bay, bearing N. ½ W., keep that mark on until Green Point bears E. by N.

A shoal having 13½ ft. over it, upon which the S.S. *San Juan* grounded, lies with the South end of Bavistock Island bearing W. by S.; Green Point, the North extreme of Long Island, N.E. ¾ N.; and the East end of Cutler Island, N. ⅝ W.

Otter Bay, formed by the three southernmost of the Otter Islands, has very good anchorage in 6 or 7 fathoms, well sheltered, but confined for a large vessel. In entering the bay the eastern shore of the western (Cunningham) island should be kept on board until well inside, when two or three small islets will open on the starboard hand, and the Boat Channel to the northward between Cunningham and Campbell Island will also be open. As soon as the small islets above mentioned show, steer for them and anchor when the N.W. and N.E. ends of Cunningham and Campbell Islands are in line. Very large vessels had better anchor on the bank between Summer and Long Island.

Northward of Mayne Channel the eastern shore is very low as far as the

base of *Mount Burney*, which is 5,800 ft. high and covered with perpetual snow. The summit of this magnificent mountain is rarely visible, but should a passer by be fortunate enough to have a clear day, he will not easily forget the magnificence of the scene.

Hartwell Bay may have anchorage among its numerous islands, but it is out of the way, and as there is no safe ship passage to the eastward of *Long Island* it is practically useless, this passage having several dangers in it, as shown on the chart.

Fortune Bay in Baverstock Island is a fair anchorage for a small vessel, but too confined for a large one.

Isthmus Bay in Zach Peninsula is one of the best anchorages in the strait or channels, and may be known on approaching it from the N.W. by a remarkable white patch on the land, about half a mile N.W. of Selfe Point; the bay is perfectly safe for the largest vessels. On the western side are several reefs, but they are all marked by kelp; and Labouchere Rock breaks when there is any sea. By keeping on the southern side the passage will be found perfectly clear, and a vessel may select almost any depth for anchorage.

If not deemed desirable to go far in, a ship passing outside the kelp, which extends a cable off Trivett Point, and steering N. by W. for half a mile, will find good anchorage in 20 fathoms, mud, with Selfe Point, the western extreme, bearing about S.W. by W.; or, if preferred, she may go a cable or two farther in on nearly the same course. The most secure anchorage, however, is in 14 to 16 fathoms, sand, in the inner bay inside Allen Point; for this continue a N. by W. course from Trivett Point until Hurlow Islet bears W.S.W., when keep N.W. for about 2 cables until the South extreme of Mallet Bay shows well outside Ives Point, whence N. $\frac{1}{4}$ E. leads to the anchorage.

Mallet Bay is too shoal to be of much use. In *Sandy* and *Inlet Bays* anchorage may be obtained, but with Isthmus Bay so near these are hardly required.

Victory Pass, separating Zach Peninsula from Hunter Island, connects Smyth Channel with Collingwood Strait and Sarmiento Channel on the North, and with Union Sound to the S.E. The latter leads to the *Ancon Sin Salida* (or No Thoroughfare Cove) of Sarmiento, and thence through Kirke Narrows to Obstruction Sound and Last Hope Inlet, which were carefully examined by the *Adelaide's* officers in the vain hope of finding an opening into Skyring Water.

Brinkley Island, situated on the East side of Victory Pass, has a high, well defined peak near the S.E. end, sloping towards the N.W.; the island is of a brownish colour, with a few stunted trees on it.

The only danger in Victory Pass is *Cloyne Reef*, a circular rocky shoal, just awash and thickly covered with kelp; with any wind the sea breaks heavily on it, but in thick weather it may not be distinguished until close upon it. As the shore of Brinkley Island is steep-to, a vessel should steer for it until Cloyne

Reef is recognised, and then pass between the reef and the island. The passage West of Cloyne Reef, between it and Hunter Island, is only 3 cables across; but when the reef can be distinguished it is perfectly safe, and with a small power vessel, if the wind be down the channel, it is advisable to keep that side, so as not to go further to leeward than necessary.

Bessel Rock, about 10 ft. above water, lies nearly half-way between Bessel Point and Brinkley Island, and is quite out of the channel.

William Bay, in *Hunter Island*, affords a good stopping place for boats.

Dixon Cove, between the South end of Newton Island and La Place Islands, is about 2½ cables in extent, and has a passage in and out at either end; it is much more sheltered than Columbine Cove, and its only objection is the depth of water, the anchorage being in 24 fathoms, but the holding ground is good, consisting of clay, sand, and mud.

Columbine Cove, 4 miles northward of Dixon Cove, is fairly sheltered, but at times the williwaws down the steep mountain side over it are furious. When blowing hard the vessel should not go into the cove, the best berth being in 15 to 16 fathoms water, a little outside a line joining Slader and Powlett Points. Excellent wood for steaming purposes may be obtained.

There is an anchorage in *Shingle Road* under the northern point in 18 fathoms, and in 25 fathoms a little farther out, but with very little shelter.

SARMIENTO CHANNEL, communicating with Smyth Channel, through Collingwood Strait and Victory Pass, stretches 70 miles to the northward, running between Piazzi Island and Staines Peninsula, and then to the eastward of Vancouver and Esperanza Islands into Peel Inlet; at the mouth of which it unites with Estevan Channel, and both merge into Inocentes Channel through Guia Narrows.

The eastern shore of *Piazzi Island* was carefully examined by Capt. Mayne. Three inlets or bays were entered towards the southern end, and then the ship was anchored as supposed where the *Salamander* anchored. This is not a fit anchorage for any vessel; the *Nassau* got 7 fathoms too close to the island to swing, and then drifted off into 40 fathoms close to the shore. There is, however, a large opening inside this which was not examined. The inlet North of this was not examined, but a smaller one about 3½ miles northward was found to be a well-sheltered bay, with 15 to 20 fathoms, mud, in the middle. Two islets to the northward mark its entrance, and there is a large kelp patch, and several small rocks southward of it. In going in keep on the northern shore to avoid a small kelp patch nearly in the middle, and when in, hard a port and anchor in the depth as above. At about 3 miles North of this again is a fairly sheltered bay which would make a stopping place; it is rather confined and exposed to the northward, but has anchorage in 7 to 9 fathoms, mud. This place is about 13 miles from Cape San Mateo.

On the opposite side of the channel South of Cape Gracia, there are two

openings, but they appeared full of rocks and kelp, without any promise of anchorage.

H.M.S. *Pylades*, 1869, found good anchorage in *Lecky Retreat*, Piazza Island, half a mile off shore in 10 fathoms, fine dark sand. The entrance of the bay bears West about 2 miles from Cape Gracia. *Occasion Cove*, at the foot of Alfredo Hill, 800 ft. high, North side of Lecky Retreat entrance, affords anchorage in 13 fathoms, stones and shells, with Ramillete Islet, on the East side of entrance to the cove, bearing E.N.E. On the West side of Occasion Cove there is a creek named *Balandra*, having near the middle of its entrance a reef marked by kelp; in this creek small vessels may anchor in 19 to 29 ft., sheltered from all winds. Wood and water can be obtained in Occasion Cove.

Vessels proceeding into Occasion Cove should, when abreast Lecky Retreat, steer to pass between Titus Islets (two small islets on the South side of entrance) and Chalas Rocks, which extend three-quarters of a cable from the North side of entrance, thence for a high hill at the head of Lecky Retreat, bearing S.W. by S. $\frac{3}{4}$ S.; and after passing Ramillete Islet steer for Alfredo Hill which will lead to the anchorage. In the kelp surrounding Titus Islets $4\frac{3}{4}$ to 7 fathoms water was obtained. Vessels without local knowledge should have a boat ahead sounding.

Double Peak Island is a good mark for determining a ship's position, especially at night, as it shows out well from the background; the two peaks lie in a N.W. and S.E. direction, therefore appear as two only when seen from the S.W.; the N.W. peak is 960 ft. high. Double Peak Island lies midway between Capes San Mateo and San Vicente.

H.M.S. *Malacca* found shelter for a night under two islets, at the southern end of the second inlet in *Vancouver Island*, 4 miles from its S.E. point. With Mayne Harbour so near, however, a steam-vessel would hardly go there.

About a cable off shore, 1 mile southward of Mayne Harbour, is a rock that covers at high water, also another on which the water breaks, nearly 2 miles northward and westward of Mayne Harbour, about a cable off shore.

Mayne Harbour, in lat. 51° 18½′ S., has an inner and outer anchorage, of which the inner is preferable, but both are perfectly safe and land-locked. The entrance is eastward of all the islands off its mouth, of which one (Eclipse Island) is large, and four small; a vessel may either anchor in 13 or 14 fathoms water in the outer anchorage, or go on to the inner one, and select a position in 7 or 8 fathoms, mud.

A shelf with 13 ft. water over it, sometimes marked by kelp, extends 150 yards off Lecky Point, on the East side of the entrance to the outer anchorage. Vessels using that entrance should carefully preserve a mid-channel course, not only to avoid Lecky Shelf, but to clear a detached spot off the islands, which was grazed by H.M.S. *Fawn* in November, 1874.

On the West side of entrance to Mayne Harbour lies a rock, covered with kelp, having about 2 ft. water on it, and $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms close around, from

which the S.E. point of Eclipse Island bears S. ¾ W., and the N.E. point W. ½ N.

Wood suitable for steaming purposes can be cut in abundance. Lake William, situated over the head of the harbour, was not tried for fish. Duck shooting may, however, sometimes be had here.

Anchorage may also be had outside the harbour, between Eclipse Island and Richard Point, in 26 fathoms, sand, but without much shelter.

Coming from the North, when abreast Mayne Harbour, the conspicuous high land of Cape Baltazar will be seen to the S.E., and a round-shaped mountain 1,624 ft. high to the westward of it; the channel lies between the two in a S.E. ½ S. direction.

Off *Point Delgada*, at the narrowest part of the channel between the mainland and Esperanza Island, the steamer *Denderah* struck on a sunken rock in 1877. From an examination made by Lieut. Hornung, of the German corvette *Ariadne*, it was found that a reef, having 3 ft. to 5½ fathoms, with 16 and 22 fathoms water close-to, extends about a quarter of a cable from the point, and the coast immediately North of it; kelp is said to show at low water on this reef. An active volcano was seen in 1879, about 26 miles E.N.E. of Point Delgada.

Puerto Bueno, nearly 20 miles North of Mayne Harbour, on the eastern shore of the channel, in lat. 51° N., is an excellent port in which a ship may find good anchorage in 8 to 9 fathoms in the middle of the harbour, or in 4 to 5 fathoms nearer the shore. Like Mayne Harbour it is divided into two, both being perfectly safe, but the inner one of course most sheltered. The entrance is between Pounds Island and Hankin Point. A small vessel may enter between Hoskins and Pounds Islands, but there is little to be gained by going in that way, and rocks extend some distance southward of Hoskins Island. Hecate Rock occupies an awkward position in this passage. There is a large fresh-water lake just above the inner harbour, which empties itself by a small cascade into a little bight at its head.

Schooner Cove, just North of Hoskins Island, is adapted for boats or very small vessels, and has a sandy beach at its head.

Cape Charles, the S.W. point of Chatham Island, is the most prominent of the many headlands in that vicinity, and is high, rugged, and barren. About 1¾ mile northward of it is *Europa Point*, off which *Suwanee Rock* was reported at a distance of three-quarters of a mile to S.W. ¼ S. It was searched for, however, without success by Capt. Simpson, of the Chilian Navy, but the captain of the S.S. *Dacia*, 1876, states that he observed it in that position at low water, and found it was marked by kelp.

Latitude Cove, on the West side of Sarmiento Channel, and opposite Cape Charles, is nearly 1 cable wide at its entrance, with 14 to 17 fathoms water; about half a mile within the entrance there is a capacious bay, in which the deepest water is 22 fathoms, bottom oaze; at the head of this bay there is a

beach, but the shores on either side are rocky. In entering keep towards the eastern shore, where the water is deepest, when within the entrance steer about S.S.W., passing half a cable West of Point Eliza, the South entrance point of the bay; on nearing this point a remarkable cascade will be seen to the westward, between which and Point Eliza anchorage may be obtained in 18 to 20 fathoms water. Vessels without local knowledge should have a boat ahead sounding.

GUIA NARROWS, so called after Sarmiento's boat, are between Hanover and Chatham Islands, and communicate with Sarmiento and Inocentes Channels. They are 6 miles long, and from 1 to 1½ mile broad, except at the North end, between Hanover or Porpoise Point, which is a low and sharp point on the West side, and Guard Island on the East, where they are only 2 cables across, but there is no danger, the shores being steep-to on either side; sometimes the tide sweeps round the point, therefore it would be strongly advisable to keep nearer the island in passing through. It is high water, on full and change, at $2^h\ 10^m$; and the flood makes to the southward, while in the Sarmiento Channel, and southward of that, the flood makes North. The tidal stream at the North entrance to the Guia Narrows, was observed from the *Myrmidon*, 28th January, 1877, full moon, to be running at the rate of 3½ knots an hour, and at 2½ knots in the narrows.

Ladder Hill, 1,285 ft. high, at the South entrance of Guia Narrows, is conspicuous when approaching the narrows from either end, having the appearance of being cut out in large steps. There is a little cove under Ladder Hill, in which H.M.S. *Malacca* spent a night, but it is quite unfit for anything but a schooner or gunboat, and not good for these. *Unfit Bay* is too deep to be good for anchorage, but in fine weather a vessel can make fast with hawsers.

The West coast of Chatham Island has many bights and coves, fronted by islands, among which is *Guard Bay*, where the *Adelaide* anchored, but the coast is too exposed to the sea and to the prevailing winds to offer much convenience, or even secure shelter.

Concepcion and Trinidad Channels were surveyed by the officers of H.M.S. *Alert*, 1879—80, and the following description is chiefly taken from the remarks of Capt. Sir G. Nares, Capt. Maclear, and Lieut. Petley, employed on that survey.

INOCENTES CHANNEL commences at Guia Narrows, and is 18 miles long to the North end of Inocentes Island, where it joins Concepcion Channel. There are islands on both sides, and some large inlets that have not been explored. The South side of the channel is formed by a succession of high cones sloping to the N.W., and ending in the Clements group. On the North side are three precipitous headlands with deep inlets between, the land then trends to the northward, and the foreground consists of islands rising to about 400 ft. in height.

Port Ochovario, on the East side, is a narrow fiord between lofty mountains,

useless for general purposes. *Paroquet Cove*, situated in the South shore of Long Island, has anchorage in 30 fathoms, sand, but it is very confined, being fit only for vessels of small size.

Wide Bay, on the East shore of *Juan Island*, is the only known anchorage in Inocentes Channel; it is deep and rocky, but well sheltered and useful to vessels bound North, and meeting a strong head gale on rounding Juan Island. To enter it, the coast of Juan Island should be kept on board to avoid a rocky patch (Ramses) in the middle of the bay; when near the head the water shoals quickly from 40 to 20 fathoms, and anchorage will be found with Green Islet, a small rocky islet 15 ft. high, bearing North, and a low hill, on the N.E. part of Juan Island W. ¼ S.

Edwards Rock, awash at low water, and marked by kelp, is seldom seen except when there is a heavy swell; it lies in a direct line between the S.W. extremes of Juan Island and Wheeler Islet, and is 1¾ mile S.S.W. of the South point of *Robert Island*, which is double-peaked, and very conspicuous from the northward. The southern and eastern coasts of Robert Island were searched for anchorage without effect.

Inocentes Island is situated at the junction of Concepcion and Inocentes Channels; its southern extremity is low, and has several low islets and rocks off it, among which there is reported to be a small and confined anchorage. The land rises gradually to the N.W. end, forming a flat ridge; the summit, *Diana Hill*, is a flat-topped hill, 567 ft. high, on the North extremity. Off the N.E. side of the island is a rock awash. *Infernet Rocks*, three rocky islets, about 8 ft. high, lie 2 miles W. ¼ S. from its South point; in thick weather, as they are very difficult to distinguish, vessels should pass on the East side of Inocentes Island.

CONCEPCION CHANNEL, separating Madre Islands from the mainland, commences at Inocentes Island, and terminates at Brassey Pass, the junction of Trinidad and Wide Channels in lat. 50° 5′ S., a distance of 30 miles, with an average breadth of 5 miles in the southern, and 2½ miles in the northern part. On the West side are many inlets, almost cutting Madre Island into an archipelago, but the only useful anchorages are Molyneux Sound and Tom Bay. The S.E. coast of Madre Island, South of Molyneux Sound, should not be approached within half a mile, as the soundings are very irregular and the coast studded with rocks and small islets. For a sealer, however, and such small craft there are many useful anchorages in that part.

Artillery Bay, to E.N.E. of Inocentes Island, contains several islands at its S.W. end, of which Taylor Rock, 3 ft. high, is the westernmost. No anchorage was found near them. At 4 miles North of Inocentes Island is *Tapering Point*, low and wooded, 1¼ mile N.W. ½ N. from which, and S.W. by S. ¼ S. half a mile from the western Chance Island, is a patch with 7 ft. on it, marked by kelp; from it a bank having 15 fathoms least depth extends 1 mile to the S.W. *Chance Islands* being low and wooded, are difficult to distin-

guish. Vessels should not approach this coast within a distance of at least 2 miles.

Eardley Bay is a deep inlet running up to the foot of a conspicuous thumb-shaped peak, 3,060 ft. high; Rocky Islet, 3 ft. high, with a clear passage N.W. of it, lies in the entrance. *Cape Childers* shows out as a bold headland; the summit has two steps, and is thickly wooded. At the base of the cape lie two wooded islands, Charles Islands, 90 ft. high.

Hugh Bay lying N. by E. 2½ miles from Cape Childers, has good anchorage in 20 to 26 fathoms, mud, sheltered from all winds but North, and even with this a sea does not set in. The entrance to the bay is obstructed by a group of rocks and islets dividing it into two passages, of which the northern is the better. Outlying rocky patches, marked with kelp, must be guarded against by keeping on board the North shore if using the northern passage, or the South shore if using the southern passage. To enter, steer for South Culling Island E.N.E., and when midway between that island and Gull Rock steer in to the eastward of Middle Island. The wind being generally astern, you will have room to round up into the anchorage. As there are no good leading marks, it is best to judge the distance by eye. If using the southern entrance, keep Stud Island close on board. Bone Island touching the South side of Ruff Rock, E.S.E., clears the sunken dangers lying 1½ cable W.S.W. of Gull Rock. The *Alert* anchored in 21 fathoms, sand, with Wigwam Point N.W. by N.

Cape San Andres, the West extreme of *Canning Island* forms the northern entrance of *Andrew Sound*, which was not examined. It is a low promontory, but 1½ mile eastward of the cape is a flat-topped range about 1,000 ft. high. The cape may be passed at a distance of half a mile. *Moraine Islands*, situated 1¾ mile North of Cape San Andres, are two small wooded islands; vessels should not pass southward of them, as two large kelp patches extend some distance into the channel.

At 18 miles within the entrance of St. Andrew Sound, it divides into two arms; the northern one is 19 miles long, and terminates; but the southern channel, which is *Pitt Channel*, trends behind Chatham Island, and communicates, as before mentioned, with Peel Inlet. *Expectation Bay* is a small anchorage 15 miles within the sound, at the eastern end of the Kentish Isles.

The S.E. part of *George Island* is low, but it has a rounded summit 2,003 ft. high, near its eastern end. *Portland Island*, 104 ft. high, lies S.W. of George Island, the passage between them forming Portland Bay, a good and convenient anchorage for vessels of moderate size.

Portland Bay may be entered from the S.E. or N.W., but the former is preferable, as a current generally sets to the south-eastward through the bay. Approaching it from the southward, keep a small islet, with a group of tall straight trees on its summit, bearing N.N.E. until Green Point, the East extreme of Port-

land Island, bears N.W. $\frac{3}{4}$ W., then alter course to N.N.W., passing between Entry Rock, 6 ft. high, and Green Point into the anchorage. A shoal marked by kelp extends E.N.E. half a cable from Green Point, and care should be used when avoiding it that the current does not take the port-bow and set the vessel over to Entry Rock. In entering from the N.W., when the passage is open, Tall Tree Islet will be seen through, bearing E. by S. $\frac{1}{2}$ S., then steer in midway between Portland and George Islands, which will give not less than 6 fathoms. The anchorage is in 7 to 11 fathoms, stiff blue clay. A good berth for a vessel to lie at single anchor is with Green Point S. by W. and Entry Rock E.S.E., but if going to remain a vessel should moor 1 cable further to the westward. *Cape Clanricarde*, North of George Island, has a small islet off it, and hence northward to Lecky Inlet the shore is steep-to, with no anchorage in the small indentations.

On the West side of Concepcion Channel are Madre Islands, the eastern coasts of which contain several anchorages. *Port Bermejo* is only fit for moderate-sized vessels, and affords but poor protection. *Monteith Sound* has good anchorage under Sunday Mountain in 15 fathoms, mud; but it is rather out of the way, and the navigation intricate.

Hocico de Caiman (Alligator's Snout) *Island* is mountainous, the summit forming a cone 1,190 ft. high, sloping down to a low point, three-quarters of a mile N.E. of Port Bermejo. Numerous islands lie on the North side of Hocico de Caiman extending to Walker Sound; vessels should not approach within a mile of this portion of the coast.

Wake Island, 40 ft. high, forms the South entrance point of Walker Bay. Anchorage in 22 fathoms, mud, for small vessels may be found in Wilson Cove, 1 cable West of Wake Island; being open to the North, it is not recommended. *Fox Point*, $1\frac{1}{4}$ mile North of Wake Island, is difficult to distinguish from the southward, but is readily made out from the northward. A rock, drying 3 ft. at low water, lies half a mile S.W. of Fox Point, and N.N.W. 2 cables from this rock is a shoal patch of 8 ft. water marked by kelp. *Walker Bay*, lying between Wake Island and Fox Point, is deep; anchorage can be obtained on the North shore under a conspicuous cone, 1,884 ft. high, but it is only fit for very small vessels. The coast between Walker Bay and Molyneux Sound, a distance of 3 miles, is clear with the exception of a rock, awash at high water, resembling a boat, 1 cable off Galeotilla Point. The separation, about 50 ft. above high water, of two cascades, resembling a hay-fork, about half a mile South of Rogers Point, is a good mark.

Molyneux Sound is a broad and extensive inlet, having a branch called *Grove Sound*, leading to the S.W., which probably joins West Channel. Off the North shore, nearly 1 mile from the entrance, is a convenient anchorage, the most easy of access in Concepcion Channel. A rocky patch of 8 ft. water, about a cable in diameter, lies S.S.E. $2\frac{1}{2}$ cables from Michael Point, the northern point of entrance. Another patch of 12 ft. lies E.N.E. $2\frac{1}{2}$ cables from Michael

Point. In entering, keep to the southward of these patches, which are both marked by kelp, but do not show well when the water is ruffled.

In approaching the sound, the high hill rising over Rogers Point should not be brought to the southward of W.S.W. until Michael Point bears N.N.W., when steer N.W. ½ W., keeping the South shore, which is steep-to, aboard till Romulo Island bears N.W. by N. ½ N. The vessel will then be West of Fawn Rock, and can steer N. by W. for the anchorage. A small rock of 18 ft. lies three-quarters of a cable South of Romulo Island. There is anchorage 2 to 3 cables off the beach, whilst farther out, 24 fathoms will be found, with the N.E. point bearing S. 40° E.

Navigating Sub-Lieut. Jones, H.M.S. *Ringdove*, 1869, remarks :—Anchorage may also be had near an island at the head of the sound in 21 fathoms, good holding ground, sand and mud, whence the highest hill at the head of the sound bears N.W. ½ N.; the centre of the island W. by S.; and the entrance points S.E. by S. ¼ S. and S.E. ½ E. The sound is about 4 miles long by 3 miles broad.

Fawn Rock, with 9 ft. water, on which H.M.S. of that name struck, in 1870, lies W.N.W., 4½ cables from Michael Point, the South entrance point bearing S.E. by S. It is about 50 ft. long S.E. and N.W., steep-to, and marked by kelp, but the prevailing current prevents the weed from showing itself until about 20 yards distant from the danger. During the twelve hours the *Fawn* remained at Molyneux Sound, the tide set over the rock to the N.W., running, from 2 to 3 hours before low water, with a velocity of 2½ knots.

A *black* buoy, surmounted by a *white ball*, is moord in 9¾ fathoms, on the West side of Fawn Rock, with the South extreme of Romulo Island bearing N.W., and the North point of Galeta de la Pesca N. by E., easterly. It cannot be depended on.

Drummond Hay Island, forming the North shore of Molyneux Sound, is high, rising to a cone 1,450 ft. high in its South part. Its North shore is formed by *Temple Inlet*, which joins Molyneux Sound by a clear channel West of the island. A good anchorage in 15 fathoms, mud, between rocks, can be obtained on the North shore, 2½ miles from the entrance, but a sharp right-angled turn to the northward, over a rocky ledge, between two islets, is against its general usefulness. The chart is the best guide. *Don Pedro Inlet*, North of Chaine Island, has anchorage in 27 fathoms, mud, 1 mile from the entrance, and communicates by a boat passage with Temple Inlet.

Tom Bay Anchorages include Tom Bay, Señoret Harbour, Tizard Anchorage, and Henderson Inlet. Strong gales, which are able to force their way in from seaward through Caffin Pass, seldom reach these ports, which possess convenient anchorages for large or small vessels, and are therefore extremely valuable to the mariner.

Tom Bay is 3 miles North of Temple Inlet. Approaching from the southward it is not easily distinguished from the numerous openings to the south-

ward of it. The best course, in thick weather, is to run the distance, by patent log, from Inocentes Island, 20 miles; and, when nearing Tom Bay, David Islets, showing as two round, wooded nobs, about 50 ft. high, will be perceived. In clear weather, Mount Bromley, 1,110 ft. high, marks the bay, showing as a smooth round-topped hill. Clements Hill, 670 ft. high, is also a good mark, making as a flat-topped hill. This anchorage has been much used of late years, particularly by the steamers of the Kosmos Company, but the bottom is rocky and uneven. The usual anchorage between Centre Island and Station Patch is very irregular and rocky. Station Patch lies about $1\frac{1}{2}$ cable E. by S. $\frac{1}{2}$ S. from William Point, has 3 fathoms on it, and is well marked by kelp.

Senoret Harbour, opening into Tom Bay, is a fine and spacious harbour. The entrance is narrow, and in very bad weather appears to break right across. The entrance is between Centre Islet and Mather Island; a spit, ending in a rock awash at high water, extends S.E. by E. $\frac{1}{2}$ E., 1 cable from Centre Islet, narrowing the clear passage to 70 yards. As the rock lies at the end of the spit, it acts as a buoy. To enter, room must be taken outside to bring the North extreme of Child Island W. by S. $\frac{3}{4}$ S. Steer mid-channel between Mather Island and Centre Rock in not less than 7 fathoms. When Centre Rock is abeam, steer W. $\frac{3}{4}$ N., and anchor as convenient. From Centre Island to Nob Point the ground is rocky, but from Nob Point to the head the bottom is mud. Perfectly sheltered anchorage in 11 to 17 fathoms, mud, will be obtained at the head of the harbour.

Tizard Anchorage affords excellent shelter for small vessels in 11 fathoms, mud, secure from all winds. The entrance lies between Parry Island and Murray Patch, but care should be taken not to mistake the rocky pass between Parry Island and Stratford Island for the passage in. It can be entered at all times, but the entrance is obstructed by a rock, with 16 ft. on it at low water springs, lying in mid-channel between Rat and Maine Islands. Having closed the port, steer for Wingate Island, W. $\frac{1}{2}$ S., till the East extreme of Stratford Island bears S. $\frac{1}{2}$ E., then close the North shore of Parry Island to avoid Murray Patch, which is well marked by kelp. Keep the kelp bordering the shores of Parry and Rat Islands, 40 ft. distant, which will give not less than 4 fathoms water. When abreast the West extreme of Maine Island, a rock 5 ft. high will be seen to starboard. There is anchorage in 16 fathoms, mud, with the South extreme of Wingate Island N.E. by E. $\frac{1}{2}$ E., and Datum Point S.E. by S. $\frac{1}{4}$ S.

If intending to proceed farther up, steer W. $\frac{1}{2}$ S. between Single Tree and Unit Islands. Pass between Scot Island and a rock with a peculiar bush on its summit, off Bond Point, and anchor in 12 fathoms, mud, with Bond Point bearing E. by N., and Observatory Islet S.E. by S. $\frac{1}{2}$ S. A reef extends N.W. 1 cable from the latter.

Henderson Inlet has the easiest entrance of the Tom Bay Anchorages. To enter, close Mehegan Point, which is steep-to; and bringing the North point

of Fletcher Island W. by N., steer in on that bearing, leaving all the islands to port. Burnt Forest Hill in line with Spero Rock W. by N. $\frac{3}{4}$ N. also leads in. Pass between Capato Point and Wingate Island, taking care to avoid Murray Patch, and to keep half a cable North of Fletcher Island. Anchor in 15 fathoms, sand and rock, with the West point of Fletcher Island S.E. by S. $\frac{1}{2}$ S., and White Cliff E. by N. *Murray Patch* extends three-quarters of a cable S.E. from Wingate Island, and is well marked by kelp. A shoal that uncovers at low water lies $4\frac{3}{4}$ cables West of White Cliff; ships should not, therefore, have too much way when passing Fletcher Island.

It is high water, on full and change, in Tom Bay, at noon; springs rise 4 ft., but the rise of tide is much affected by the wind.

Day Bay, 2 miles North of Michegan Point, has a confined anchorage in 18 fathoms, but with Tom Bay so near it is not required. Brazo Ancho Point is low, but the land rises abruptly to a height of 1,215 ft.

WIDE CHANNEL (Brazo Ancho of Sarmiento) commences at Brazo Ancho Point, the N.E. extreme of the Madre Islands, where Trinidad and Concepcion Channels meet Wide Channel, and extends 38 miles to the northward from Topar to Saumarez Island, with a breadth varying from $1\frac{3}{4}$ to $3\frac{1}{2}$ miles. The navigation of Wide Channel is often impeded by *drift ice* from Eyre Sound. Numerous large pieces of ice have been seen in this channel in June.

Lecky Inlet, on the East shore of *Wide Channel*, opposite Topar Island, was searched for anchorage without success. There is 10 fathoms, mud, in a very confined position, 3 miles from Squire Point, in a small cove on the northern shore. *Arthur Islands* lie off the South entrance point, and form with the shore a deep passage, having no anchorage within it. *Small Craft Bight* is merely a slight indentation on the coast. *Gage Inlet*, about 20 miles North of Tom Bay, has a small anchorage at its head, about 4 miles within the entrance. It is, however, too far out of the way and the inlet is too tortuous to be of much use.

Sandy Bay was not examined by the *Nassau*, but the Hudson Bay Company's steamvessel *Labouchere* steamed into it in search of a bight likely to afford anchorage; but, not succeeding in finding one before dark, the vessel had to keep under weigh all night.

Dolores Reef, the greater part of which covers at high water, lies nearly $1\frac{3}{4}$ cable from Elliott Peninsula, on the West side of Wide Channel; it is about 100 yards in extent, marked by kelp, and joined to the peninsula by a ledge of rocks having 6 to 12 ft. water. *Grau Cove*, the South entrance point of which is connected with Dolores Reef by a shoal, is nearly 3 cables wide at its entrance, and about one-third of a mile deep, with depths of 15 fathoms, rock, near the centre; the North entrance point is steep-to.

Ringdove Inlet, an opening between high hills opposite Sandy Bay, in lat. 49° 47′ S., has many small creeks and coves on either side, in which good anchorage may be obtained. The *Ringdove*, whilst experiencing bad and thick weather in the main channel, steamed 4 or 5 miles up the inlet (which appeared

to extend some distance inland), carrying from 7 to 12 fathoms water, no kelp being visible, whilst the depth increased as the vessel proceeded. A well sheltered anchorage was found in one of the numerous coves in 14 fathoms. No rise or fall of tide was observed in this inlet, but it is probably the same as in other parts of these channels, viz., from 2 to 5 ft.

Richmond Cove.—Lieut. Very, U.S.S. *Richmond*, 1876, reports an anchorage in 17 to 12 fathoms, hard bottom, about one-third of a mile East of Hyacinth Point, the South entrance point of Ringdove Inlet. The *Richmond* anchored about a cable E. by S. from the easternmost of Jones Islets, situated just eastward of Hyacinth Point; south-eastward from this anchorage lies an island which, with Jones Islets, form a cove with room for several vessels.

Saumarez Island.—There is a passage on either side of this island, but Grappler Reach, the eastern, is the wider of the two, passing close to Bold Head, an immense dark mass of rock, rising abruptly from the sea to the height of 1,000 ft.; abreast of this head is the entrance to *Eyre Sound*, which is 40 miles long, with an average breadth of 4 miles. Near its entrance on the eastern shore there was, in the *Adelaide's* days, a large rookery of seals, and another 13 miles farther up on the same side, in lat. 49° 21′ S. *Chasm Reach*, the passage West of Saumarez Island, though narrow, is perfectly clear and deep. In the autumn, when the ice from the glaciers at the head of Eyre Sound comes down in inconveniently large lumps, its navigation would be safer than the eastern passage; even going to Port Grappler it would be almost as short, but except for avoiding ice it has no advantage. H.M.S. *Opal*, in 1876, found anchorage in 17 fathoms just to the southward of the South entrance point of *Veto Inlet*, on the West side of the North end of Chasm Reach, with the islets in the inlet a little open of the point. The inlet appeared to have a good entrance, and probably good anchorage.

A shoal extends from 1 to 4 cables from the North point of Saumarez Island, on which H.M.S. *Amethyst* struck in 1878. It was examined by Nav.-Lieut. A. W. Miller, who found the shoal has two rocky heads 2 cables apart N.W. by N. and S.E. by S., with 10 fathoms between; the easternmost head, situated nearly 1 cable N.N.W. from the North point of Saumarez Island, has 12 ft., and the westernmost head 13 ft. water. The kelp hereabout was visible only from a short distance. The flood tide in this vicinity was observed to set N.E., and the ebb South, towards the shoals.

Port Grappler is an excellent well-sheltered harbour in the Exmouth Promontory, opposite to the N.E. side of Saumarez Island. Cloué Island, in its entrance, shows so distinctly that it is impossible to mistake the position of this harbour. There is a passage on either side of this island, but the eastern one is the wider and better. The best anchorage for a large ship is 3 cables inside Cloué Island, in 8 to 9 fathoms, mud; but a small vessel may pass Diamond Island, and anchor in 4 to 5 fathoms off Allard Point. The holding ground all over the harbour is excellent, however, and a vessel may choose her berth

where she pleases; but above Diamond Island the shoal water extends farther from the shore, and the anchorage ground becomes confined.

The vessel should endeavour to reach this harbour from Puerto Bueno, if possible, in the day. There is no danger known in steaming slowly along the Wide Channel all night. Inocentes Channel should not be entered at night, unless in very clear weather indeed.

INDIAN REACH, 30 miles long between Saumarez Island and the English Narrows, presents no difficulties to an ordinarily cautious mariner. After passing Saumarez Island, the course lies up the East shore for about 8 miles, when the ship will be between Crossover Island on the West side, and two or three small islets close in shore, joining a sandy beach on the East. Several small rocky islets (Covadonga Group) will be seen nearly in mid-channel from this position, whence the vessel must cross to the West shore, leaving all these islets on her eastern side. A white staff, surmounted by a sphere, has been erected on the S.W. islet. After they are passed she should haul out mid-channel to avoid *Gorgon Reef*, which rises a few feet above low water off the South entrance point of Eden Harbour. Eden Island, shut in by Greville Point, leads to the N.E. of Gorgon Reef. A sunken rock, on which the German S.S. *Karnack* struck in 1875, is said to lie about 4 cables N. by W. from the North point of Crossover Island.

Capt. Maclear, H.M.S. *Alert*, 1880, states that there is deep water on both sides of the Sister Islands, 25 ft. high, the easternmost of the Covadonga Group, and vessels may proceed direct through the eastern channel.

On Guia Island, the northernmost of a group extending from Clarke Point, on the West side of the reach, is a beacon which serves as a mark for clearing Gorgon Reef.

Toro Island, the northernmost of the *Covadonga Group*, has 4½ fathoms all round it. A sand-bank, covered with seaweed, was discovered in Indian Reach in April, 1874, by the French gun-vessel *Infernal*. The bank lies N.E. by N. ½ N. one-third of a mile from Toro Island, and N.W. ½ W. from the easternmost of the Covadonga Group. *Penguin Rock*, marked P.D. on the plan of Indian Reach, is situated nearly midway between Toro Island and Vaudreuil Rock.

Vaudreuil Rock is nearly awash, with 4¾ to 7½ fathoms on the edge of the kelp surrounding it. The rock is a northerly extension of Covadonga Group, and lies three-quarters of a mile N. by W. ½ W. from Toro Island.

H.M.S. *Fantome*, in 1874, found anchorage for a night under Fantome Island, one-third of a mile S.E. from Crossover Island, on the West side of Indian Reach, in a depth of 28 fathoms, sand, shells, and rock, with the extremes of Fantome Island bearing N.W. ½ N. and N. ½ W. From an examination it was found that anchorage may be had nearer Fantome Island.

Port Horacio, on the West shore of Indian Reach, 5 miles North of Saumarez Island, is protected by Elliott Island at its entrance, and is said to afford good

anchorage. At a quarter of a mile from the South point of Elliott Island is a rock which uncovers only at low water.

Port Riofrio is on the West side of Indian Reach, and nearly $1\frac{3}{4}$ mile northwestward of Toro Island. The entrance to the port is divided into two channels by Covadonga Rock, which is (or was) marked with a perch; the North channel between Covadonga Rock and the South point of Marta Island is the better, being deeper and wider. On the western shore of the port, and abreast of the North channel, is a remarkable cascade, which being brought to bear W. by S. $\frac{1}{4}$ S. will lead nearly through the middle of the North channel, in 27 fathoms; a vessel may anchor on that line of bearing in 20 to 25 fathoms, mud, about $1\frac{1}{2}$ cable off shore; or farther to the N.W., nearer Marta Island, in 18 or 20 fathoms, mud.

A patch of kelp, apparently indicating a shoal, was seen by H.M.S. *Zealous* on her passage to the southward through Indian Reach, in 1873, between Morton Island and Gorgon Reef, a little to the westward of the fairway track. At the time of the course being altered to avoid the patch, Gorgon Reef bore S. $\frac{1}{4}$ E. $1\frac{1}{2}$ mile, so that it would be advisable, after passing Morton Island, to keep in the track, until Greville Point bears W. by S., when the spot will be passed. In 1879 this patch was searched for by H.M.S. *Alert*; no kelp was seen, and 80 fathoms was found in and around the given position.

Eden Harbour is formed by a group of thickly wooded islands on the western shore of Indian Reach, about 5 miles South of the English Narrows, and has good anchorage in 8 to 12 fathoms. Coming from the northward it may be entered between Morton and Dulce Islands, but the best entrance is South of Charles Island, midway between it and Hammond Reef. When in the entrance a remarkable tree on Jenkins Hill will be seen, bearing about N. by W. $\frac{1}{2}$ W., and this tree kept half a point on the starboard bow will lead to the anchorage. The best anchorage is between Eden Island and a small beach N.W. of it, in 12 to 14 fathoms, taking care not to get too close to Bare Rocks off Eden Island. Farther in is Malacca Cove, which is perfectly sheltered but very confined, with anchorage in 7 fathoms, mud.

Lackawana Cove, immediately South of Eden Harbour, and *Level Bay*, on the eastern side of the channel, with Eden Harbour so near, are quite useless.

Duke of Edinburgh Sound, or *Rondizzoni Bay*, on the East side of the southern entrance to English Narrows, was explored by the Chilian vessel of war *Magallanes*, and is said to be free from dangers, having near the middle 35 fathoms, with no bottom, but within 30 or 40 yards of the shore there are moderate depths, the bottom consisting of sand, mud, and gravel.

ENGLISH NARROWS.—Except when passing Mid-channel Island, the English Narrows present no difficulty, and even there in the narrowest part, 1 cable, there is no danger unless a vessel goes through with wind and tide, which should never be attempted if the wind be strong. After passing Adam Island the eastern shore will naturally be kept on board, and is the best for

approaching the narrows. Kitt Island should be given a wide berth, as there is a small rock lying about a cable off it; and Chinnock Island should be passed about 1½ cable off, as there is a patch (Look-out Shoal), with only 3½ fathoms, about 3 cables N.N.W. of the island. From Chinnock Island it is essential to keep on the East side, as there is foul ground off Croft Island, extending halfway across the channel; as this is passed, Mid-channel Island will be plainly seen, and the passage East of it will be opened.

Close to the South end of Mid-channel Island are detached rocks (Hall Rocks) awash, and beyond these kelp extends for some distance. A pyramidal *beacon*, formed of casks and poles, whitewashed, has been placed on the North end of the island, at 10 ft. above high water.

The channel on either side of the island is safe, but a large vessel should take the western, which is the wider and deeper of the two, and least affected by the tide.

Directions.—After passing the rocks off Croft Island, the vessel should cross gradually to the western shore, and follow it round while passing Mid-channel Island. Should the tide be making to the southward, care must be taken not to let it catch the ship on the starboard bow and cant her head in shore, as happened to H.M.S. *Zealous* in 1872, causing her to strike on a 17-ft. rock lying 100 yards southward of Zealous Islet, half a mile South of Mid-channel Island. Should the tide be making to the northward, the helm must be ported quickly after passing the island, or the ship will be set on *Caution Shoal*, which extends off Clio Islet and the South point of Patagonia Island; in 1878 it was marked by a conical *white buoy*, with *Kosmos* on it in black letters, lying near its eastern edge in 8¾ fathoms, with the South point of Clio Island bearing W. by S. ¾ S., the West point of Loney Island N. by W. ¾ W., and Cedar Point S. by W. ½ W. If the eastern channel be taken the island shore must be kept close aboard, as Danger Shoal extends for some distance off *Cedar Point*. A shoal, not always visible, and having 13 ft. on it, and 6 to 8 fathoms close-to all round, lies 1½ cable E. ½ S. from Clio Island. The kelp on this shoal does not always show, owing to the strength of the tides. On Cedar Point a white staff, surmounted by a barrel, was erected in 1878.

After Clio Islet and Cedar Point are passed, the channel is perfectly clear the whole way to the Gulf of Peñas, but the tide makes with considerable strength until Cavour and Lamarmora Islands are passed, A white pyramidal *beacon*, 26 ft. high, was erected on the summit of *Cavour Island*, 270 ft. high, in 1878.

On the eastern shore of English Narrows, a patch of kelp extends about 1 cable off a point bearing N.E. ½ N. from Eve Point; at the extremity of this kelp, Paradise Point, the N.W. entrance point of Duke of Edinburgh Sound, bore E. by S. ¼ S.

Capt. Maclear, H.M.S. *Alert*, 1879, reports that the beacons on Cedar Point and Cavour Island have disappeared.

In making the English Narrows *from the northward*, the same care must be taken to avoid the shoal water off Cedar Point and Clio Islet; and, as before remarked, a vessel should not attempt the passage with the wind and tide, if the former be strong, unless she is being navigated by some one possessing local knowledge. At the back of Moat Island there is a remarkable grayish patch, resembling a castle, which, if steered for after passing Direction Islands, will lead to the northern entrance of English Narrows.

There is anchorage on either side the English Narrows in mid-channel, where in calm weather a vessel might wait the turn of the tide. The holding ground is indifferent, however, and the ship is sheered about by the tide, so that she is apt to trip the anchor, in the event of which she would probably be set into the narrows before getting steerage-way on.

In August, 1879, a volcano was observed from H.M.S. *Gannet*, bearing about E. by N. ¼ N., distant 34 miles from Hume Island, at the northern entrance to English Narrows. Eruptions appeared to be taking place at intervals of 3 or 4 hours. This was probably the volcano of *Chalten*, placed by Señor Moreno, who reported it in 1877, in lat. 49° 8′ S., long. 73° 10′ W.

Tides.—It is high water, on full and change, in English Narrows, at $0^h\ 15^m$; springs rise 6 ft. The tides are very regular through, but have much greater force than elsewhere in the channels. At springs the stream runs 6 knots past Mid-channel Island. The flood and ebb streams are considered to run for about three-quarters of an hour after high or low water by the shore.

PORT SIMPSON, on the western shore of English Narrows, and about 8 miles N.W. of Eden Harbour, was explored by Capt. E. M. Simpson, of the Chilian navy, in February, 1875, and by Capt. F. C. B. Robinson, H.M.S. *Opal*, in 1876. The port is approached by Beauchamp Inlet, extending 1¼ mile to W.S.W., and three-quarters of a mile broad at its entrance; at a quarter of a mile within the entrance there is a depth of 40 fathoms near the centre, and 9 to 11 fathoms, mud bottom, near the entrance of the port. The entrance to Port Simpson, which lies between Enrique and Roberto Points, is three-quarters of a cable wide, with 7 to 10 fathoms water; it is, however, contracted to about half a cable by the rocky shoal extending from Roberto Point on the North side.

Port Simpson is about 1 mile long, with an average breadth of 2½ cables, and affords secure anchorage in 24 to 8 fathoms, mud bottom. Just inside the entrance there is a depth of 24 fathoms, decreasing to 9 and 7 fathoms abreast Hellen Point, thence 9 to 4 fathoms to the head of the port, where there is a fresh-water lagoon, over the bar of which there is about 7 ft. at high water. Wood, suitable for steaming purposes, can be obtained; that of the best quality was found by the *Opal* just to the eastward of Hellen Point, on the South shore.

It is high water, on full and change, in Port Simpson, at $0^h\ 15^m$; springs rise about 6 ft.

Lucas Cove, 2 miles South of Mid-channel Island, is a good anchorage for any but the very largest vessels. There is 4 fathoms in the channel, and no danger if the southern or mainland shore is kept on board. The cove is about 2½ cables wide by 4 cables long, and has anchorage in 10 to 11 fathoms in the centre, with a bottom of mud. A large vessel will find anchorage outside the cove in about 20 fathoms water.

Hoskyn Cove, nearly as far northward of English Narrows as Lucas Cove is to the southward, has good anchorage in the middle of the cove in 13 fathoms, mud. Care must be taken in going out or in, as the tide sweeps rapidly past Loney Islet, and catches the vessel's bow or stern, whilst her other end is in the dead water occasioned by the island.

Just outside the cove the channel is only 1½ cable wide, but both shores are steep-to, and after this narrow part Messier Channel opens out, extending as far as the eye can reach, between lofty mountains covered with snow.

MESSIER CHANNEL, 75 miles long in a N.N.W. direction, from the North end of English Narrows to its outlet at Tarn Bay, in the Gulf of Peñas, is quite open, and free from all impediments. All the inlets may be entered with perfect safety, but the depth of water is far too great for anchorage. The number given, however, will be found amply sufficient to render this navigation perfectly easy in moderately fine weather. The real difficulty of it consists in the almost perpetual rain, thick weather, and strong gales, with very heavy squalls or williwaws, which come down the steep mountain sides with a force which must be felt to be believed.

Entrance Rock is low and flat, situated on the North side of the entrance to Magenta Bay, and 7 cables East of Thomas Island; from the prominent position of the rock it is a good mark for pointing out the direction of the North entrance to English Narrows.

Halt Bay, on the eastern shore, at the commencement of Messier Channel, has been much used by ships passing through; but the water is very deep, and the space confined, so that Gray Harbour and Hoskyn Cove should entirely supersede it.

Gray Harbour affords excellent anchorage at the head of Liberta Bay, 2 miles East of Halt Bay, where a vessel may lie in perfect security in 16 to 17 fathoms, with a bottom of stiff mud.

The firewood here seems also to be as good as that in Halt Bay, which was highly praised by Capt. Paynter, of H.M.S. *Gorgon*. At the head of the harbour is a large fresh-water lake, which may be entered by a boat at high water.

Thornton Island, 20 miles northward of Gray Harbour, is about 5 miles long, with a table-topped mountain in the centre, 1,200 ft. high.

White Kelp Cove, in Lion Bay, is very confined, and not nearly so good as

Connor Cove, on the same shore, 2 miles North of Lion Bay, where there is anchorage in the middle in 13 fathoms, stiff mud. *Boyle Rock*, which is said to lie rather more than a mile off Connor Cove, is awash at low water, and is well marked by kelp. This rock was unsuccessfully searched for by Captain Bossi, of the Chilian war-vessel *Charrua*, 1876.

Middle Island has two peaks; the North is about 2,200 ft. high, and the South about 2,100 ft., very conspicuous from the northward, being visible as soon as a vessel enters Messier Channel. Its shores are steep-to, and it can be passed on either side. *Waterfall Bay*, 12 miles North of Middle Island, affords very poor anchorage.

Island Harbour, on the eastern shore, 20 miles from the Gulf of Peñas, is a small but landlocked anchorage, well placed for vessels entering or leaving these channels, with good holding ground, plenty of wood and water close at hand, and at times abundance of fish. In entering, the island may be passed on either side, but the North passage is the straighter. There is a patch with $2\frac{1}{4}$ fathoms on it about half a cable South of Phipps Island, and a group of rocky islands surrounded by kelp off the South point of the main. The anchorage is in 19 fathoms, rather more than a cable inside Phipps Island, with the extremes bearing S.W. $\frac{1}{2}$ S. and S.E. by S. A small vessel may, however, go into the inner basin, and anchor close to the large waterfall at the head of the harbour, in 10 fathoms, but her stern must be secured to the trees, as there is not room to swing. There is also anchorage outside the harbour in 15 fathoms, with Point Fleuriais bearing N.W. $\frac{3}{4}$ W., and the South point of Phipps Island N.E. $\frac{1}{2}$ N.

Millar Island, on the West side of Messier Channel, and about 6 miles inside the North entrance, is 2,400 ft. above the sea, and conspicuous when approaching Messier Channel from the North. *Fatal Bay*, being quite unsheltered with 25 fathoms close to the rocks, does not deserve the name of an anchorage. The highest of the *Baker Islands*, on the East side of the northern entrance to Messier Channel, is about 3,000 ft. high.

Hale Cove, in which there is perfectly sheltered anchorage in 16 or 17 fathoms, with a muddy bottom, is 10 miles North of Island Harbour. Two remarkable white patches of bare rock, one much larger than the other, on the side of Mount Orlebar, immediately over the anchorage, served to mark its position well. Anchorage may be had outside the cove, but it is not well sheltered, and the bottom is rocky. Off Hale Cove are three islands named Alert, Scylla, and Scout, and two islets, the northern island, Scout Island, being much the largest, and 2,600 ft. high.

Tarn Bay, in which the channels from Magalhaens Strait open into the Gulf of Peñas, is about 15 miles wide, and has been before described.

Port Ballenas.—If, after reaching Tarn Bay, the vessel should be met by a strong foul wind, or the still more common occurrence of a heavy westerly sea into the Gulf of Peñas, and she has not time to reach Port Otway, a fairly good

anchorage may be had in the first deep indentation on the S.E. side of Wager Island. The space is confined, and the bottom uneven and rocky, but it is quite sheltered by the island from all northerly and N.W. winds, and no sea can get up there. A depth of 11 fathoms may be had on the West side off a small islet, with just room to swing.

H.M.S. *Rocket*, 1875, obtained shelter during a north-westerly gale in a small bay, having good holding ground, on the S.E. side of Sombrero Island, the North entrance to Messier Channel, anchoring in 20 fathoms, mud, with Sombrero Peak bearing N.W. ½ W., and the extremes of Zealous Island E. by N. ¼ N. and S. by W. ¼ W.; the depths in this bay decrease suddenly to 3 fathoms close to the kelp which fringes the shore. During easterly winds it would be advisable to anchor farther to the eastward in 30 or 40 fathoms, mud. The *Rocket* having to take shelter on a second occasion in this bay, anchored in 42 fathoms, mud, with Sombrero Peak bearing N.W., and a small island off the S.E. point of the bay S.W. by W. ½ W. Care is necessary in rounding the South side of Sombrero Island, which has several outlying rocks.

The preceding descriptions of the Inner Channels will be more clearly understood by reference to the Admiralty chart, especially by those improved by the surveys made (1868-69) by Commander R. C. Mayne in the *Nassau*, and by the officers of H.M.S. *Alert*, in 1879.

We again resume the description of the outer coasts.

The *Coast northward of Cape Tres Montes* is lofty and weather-beaten. It is remarkable for the bold outline of its hills, and the thick covering of forest, even on the most precipitous flanks. There is no outlying danger beyond 2 miles off it. The water is deep, and the land from 2,000 to 4,000 ft. high. *Cape Raper*, 13 miles N.W. of Cape Tres Montes, has rocks extending about one-quarter of a mile off it, and a reef, on which the sea was breaking, was seen 1 mile W. by S. ¾ S. from it.

Cape Gallegos, 15 miles N.N.W. from Cape Raper, is a bold promontory, barren to seaward, and rising abruptly from the water. Westward of it is *San Andres Bay*, in which is *Cone Creek*, narrow, and easily recognised by its proximity to a singular cone, 1,300 ft. high, even more perfectly conical than the famous Sugarloaf at Rio de Janeiro, an unfailing landmark. It is a place difficult to be got out of by a sailing vessel, and not to be recommended unless in distress. There is also anchorage in *Christmas Cove* in the S.W. part of the bay. *Useless Cove*, on the northern side of the bay, is well named. Pringle Point is the North point of San Andres Bay, and hence to Rescue Point the land is considerably less high. Stewart Bay and Cliff Cove seemed to promise anchorage.

Port San Estevan, 20 miles N.N.E. of San Andres Bay, is sheltered by

Rescue Point,* in lat. 46° 18′ S., and terminates in a fresh-water river, or rather mountain stream. Dark Hill, 2,150 ft. high, is an excellent mark for it.

Hellyer Rocks are a very dangerous patch, having soundings around them, and lying 6 miles from the nearest land, in lat. 46° 4′, 14 miles N. by W. $\frac{3}{4}$ W. (*North, true*) from Rescue Point. The sea breaks on them.

CAPE TAYTAO, or *Taytaohaohuon*, in lat. 43° 53′ 20″ S., is one of the most remarkable promontories on this coast, and forms the S.W. point of the land encircling the Chonos Archipelago. It is a high, bold promontory, and its neighbourhood is an unprofitable wilderness of rocky mountains, woody and swampy valleys, islands and rocks in profusion, and inlets or arms of the sea penetrating in every direction. It makes like a large island, pointed at the summit, and is nearly 3,000 ft. high, rugged, barren, and steep. Several rocks above water lie around it; none, however, a mile off shore. About 5 miles eastward of the cape is *Anna Pink Bay*, so named by the surveyors from the narrative in Anson's Voyage. Within a cove of this bay the *Anna Pink*, one of Anson's squadron, employed as a victualler, took refuge from westerly gales. She anchored under Ynche-mo Island, but drove from thence across the bay, and subsequently brought up in Port Refuge.

Port Refuge is a safe but out-of-the-way place. It is described in Anson's Voyage (chap. 3) in very glowing colours; but it may be remarked, that those who discovered it were here saved from destruction.

Canaveral Cove, West of Port Refuge, though small, is very convenient for refitting, or executing any repairs. *Patch Cove* is so small as to be unfit for vessels of any size exceeding 200 tons.

About 6 miles N.E. of Ynche-mo are the *Inchin*, or *Fernando Islands*, and next to them are the *Tenquehuen*, *Menchuan*, and *Puyo Islands*, among which, no doubt, there are many good anchorages, and abundance of fresh water, wood, wild herbs, and fish.

CHONOS ARCHIPELAGO extends from the peninsula of Taytao to the island of Chiloe, between the parallels of latitude 46° and 44° S.; it consists of a large number of barren, rugged, and lofty islands, rising to an elevation of 2,000 to 4,000 ft. above the sea.

The interior sounds behind these islands have not been thoroughly surveyed, but they are supposed to contain harbours as numerous as the islands. The inner coasts of Skyring, Clements, Garrido, and Isquiliac Islands, are like the outer, high, rugged, and barren, ranging to about 3,000 ft. above the sea. In the middle of Darwin Bay, that large bight between Tenquehuen and Vallenar Islands, is a detached and dangerous islet named Analao. Darwin Channel leads from Darwin Bay into the interior sounds behind the Chonos Archipelago,

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* Upon Rescue Point the *Beagle* found five seamen, who had lived in these solitudes, in excellent health, on seals, shell-fish, and wild celery, for thirteen months. They had deserted from an American whaler, in October, 1833, near Cape Tres Montes.

and is perfectly safe for the largest ships. When inside, the navigation is comparatively easy. It has also the advantage of an anchorage at either end, Vallenar Road outside, and Port Lagunas inside.

In the different channels of the Chonos Archipelago, the dangers are generally marked by kelp, and in the quiet bays it will frequently be found growing in deep water, where the bottom is rocky. A good lookout should be kept from aloft, as strong currents frequently draw the kelp under water. In the channels which have an East and West direction, the flood sets to the eastward, and the ebb to the westward. In those having a North and South direction, the flood generally sets to the northward and the ebb to the southward.

The prevailing wind is from the westward, the climate healthy, but moist and tempestuous, especially during winter; in summer, occasionally for several weeks together, the heat is so intense, that the small streams dry up and fresh water becomes scarce.

Pilots may be found in any part of the archipelago during the summer, but they should not be depended on, except for pointing out the direction of the channels.

Darwin Channel trends in an E. by S. direction for about 16 miles, whence it turns a little to the northward; a white rocky islet will then be seen standing well out in the channel. This islet must be left on the starboard hand. The channel then turns to the N.E. for about 8 miles, and a deep indentation with several islets in it leading North will be opened. This must be passed, and the coast will now trend about East, until another large island is passed, and then the principal channel northward will be opened, the distance from the entrance being about 40 miles.

On the South side of Darwin Channel, and about 5 miles East of Alfredo Point, is the entrance to William Channel, which is about half a mile wide, and trends S.S.E. for 5 miles to *Port Yates*, where anchorage may be had in 12 or 14 fathoms, sandy bottom.

Port Lagunas, situated on the West side of the North entrance to Moraleda Channel, is a good anchorage, but rather small.

Vallenar Road, within Vallenar Islands on the North side of Darwin Bay, is well pointed out by the mountain of Isquiliac, which is 3,000 ft. high, rugged, and triply peaked. It is an excellent roadstead, easy of access and egress. The best anchorage is in about 12 fathoms water, near the little islet which lies off the S.E. end of Three Finger Island. The *Beagle* lay there during a heavy S.W. gale.

SOCORRO or HUAMBLIN ISLAND lies off the Chonos Archipelago, its South extreme being in lat. 44° 55′ 50″ S. It is a comparatively low and level island, 9½ miles long, and about 300 or 400 ft. high, except one hill, which is about 700 ft. When made from the offing, it is considerably detached from those which seem like Tierra del Fuego, being a range of irregular mountains and hills, forming apparently a continuous coast.

The three outlying and neighbouring islands of Huamblin or Socorro, Ypun or Narborough, and Huafo, or No-man's Island, are thickly wooded, and rather level, compared with their neighbours, and not exceeding 800 ft. in height. There are few, if any others, like them in the Chonos Archipelago; almost all the rest, however portions of some may resemble them, being mountainous, and very like those at Tierra del Fuego and the West coast of Patagonia, beyond 47° S. The vegetation is therefore much more luxuriant, and there is a slight difference in it, consequent, probably, upon a milder climate. There are some productions, such as canes and potatoes, &c., found, which do not grow near the Strait of Magalhaens. The formation of the three islands is a soft sandstone, which can be cut with a knife as easily as a cake of chocolate.

The whole of the surface of the Chonos Archipelago, of which little was correctly known prior to the *Beagle's* survey, is a succession of high and considerable islands, so near one another, that, from the offing, they make like a solid unbroken coast.

ADVENTURE BAY, to the eastward of Huamblin, is encumbered by dangerous outlying rocks. *Paz* and *Liebre Islands*, in the middle of the bay, are remarkable from their height and conical form, but they afford no shelter. Under Ypun or Narborough Island, however, there is good anchorage in 12 to 16 fathoms, over clay and sand; and *Scotchwell Harbour*, at the S.E. part of the island, is not only a valuable place of refuge, but a perfectly secure and agreeable place for wooding, watering, or refitting. On these islands were a considerable number of seals.

The Island of Ypun resembles Huamblin in its character, and therefore differing totally from the rest of the neighbouring islands, which are high, rugged, and generally barren to seaward; while these are comparatively low, level, and fertile. Scotchwell Harbour should be approached from the northward, because, although the passage South of it has been examined, and appeared to have no hidden dangers, it is narrow, and there may be undiscovered rocks.

The cluster of islands between Narborough and the Guaytecas offer no anchorages so easy of access to a stranger as those previously mentioned.

Guaytecas Islands.—At the North end of the Chonos Archipelago, among the group of islands called *Guaytecas*, will be found *Port Low*, an excellent harbour; in approaching it a good berth must be given to the numerous rocks that lie along the North and N.W. shores of those islands, and allowance made for the stream of tide, which is felt off Huacanec Islands, and causes a race off Chaylaime Point.

In running for Port Low from the westward, the Guaytecas Islands appear in a hummocky ridge, at the N.E. point of which there is a remarkable flat-topped island. This table looks like the N.E. point of a large island, of which the S.W. part diminishes into low land. When seen from a considerable distance, about 20 miles, the flat island, summit-knobbed hill, and hummocky

ridge, are still conspicuous. This hummocky ridge appears to be the middle of a group of islands. On the left, looking to the S.E., is a single-knobbed hill inland, which looks higher and insulated. As far again to the left is the flat-topped island already mentioned, beyond which there appears to be an opening; the low land to the westward makes like many islands.

Port Low has the usual supplies: water of excellent quality, wood, fish, shell-fish, including oysters, and wild herbs. Of late years, potatoes have been planted by otter-hunting and sealing parties from Chiloe, therefore a small supply may be looked for. This is a port in which a number of large ships might lie conveniently, it being one of the best harbours on the coast.

Melinka Harbour, so called by the Chilian Government, but Puerto Arena by the sealers, is on the S.E. side of the North Guayteca Island, and runs up close to Port Low. There is a small establishment for sealing and cutting rail-way sleepers in this port. The entrance is round the S.E. point of the North Guayteca Island, on a course of about South, until a few houses on the North side of the bay come in sight, when haul up for them and anchor in 15 to 7 fathoms, stony bottom, with Melinka Point bearing N.E. by E. The holding ground is said to be better farther out in 20 fathoms. This port is completely sheltered.

HUAFO ISLAND.—Westward of Guaytecas Islands, distant about 20 miles, is Huafo or No-man's Island, a large island, but without a harbour, except for boats; the highest part is the N.W. head (Weather Point), 800 ft. above the sea. Reefs extend 3 miles seaward to the North and West. It is highest at the N.W. end, low in the middle, and high again at the S.E. extremity; it is well wooded, and formerly had many sheep on it, while the aborigines lived there in peace.

CHAPTER IV.

THE ISLAND OF CHILOE.

The Island of Chiloe is the northernmost of that vast chain of islands which fronts the American continent from lat. 42° southward to Cape Horn. From its situation, it is of great importance, and under its former domination, was considered as the key to the King of Spain's possessions in the Pacific.

It is about 100 miles in length, by about 35 miles in breadth, and within, or to the East of it, is a numerous archipelago of islands, 63 in number, of which 36 are inhabited. The Island of Chiloe itself, or Isla Grande, is hilly but not mountainous, and covered with one great forest, particularly cypress, and "alerse," a variety of it; these affording a large article of export, in the form of planks. The interior of the island is not known, and the only road is an artificial one between San Carlos and Castro. The other articles produced are potatoes, wheat, barley, and hams, for which it is famed. Poultry may be had in abundance.*

The Province of Chiloe, or *Ancud*, is one of the political divisions of Chili. Its northernmost limit is the South bank of the Maullin, and it extends southward to Tres Montes, but there is nothing to govern on the Chonos Archipelago. Its name is significant of the origin of its people—"Chili-hue," which means "further," or "new," or "the end of," of Chili. Hence, Chilóe, or Chiloé as it is sometimes written and pronounced, into which it has been corrupted. It was first discovered by the Spaniards, in 1558, when it was thickly populated by Chonos Indians, or Huyhuen-che. The first Spanish settlement was made in 1566, when the city of Castro was founded. The language used is almost exclusively Spanish.

By the decree of Febuary 28th, 1855, the island was divided into four departments; the principal population, which would appear to be considerable for the districts occupied, are centred at San Carlos, and in Castro, and Lemui. In 1832, the census gave a total of 43,832 for the population of the province;

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* There is a good deal of *coal* in Chiloe (as in the Island of Lemui), but of an inferior description, like that of Concepcion. It is not true coal—lignite would be a more appropriate term. However, it burns readily.—*FitzRoy*, p. 382. See hereafter on this subject.

in 1844 it was 48,912, and in 1854 it was 61,586. In 1872 it was 64,148, having more than quintupled itself since 1787.

The *climate* of Chiloe is considered by those who live in other parts of Chili to be rigorous, cold, and damp; certainly there is much reason for such an opinion, particularly in the winter months, when it almost always rains, and the wind, with little cessation, blows hard from North to N.W., and by the West to South; but notwithstanding the great quantity of rain that falls, the evaporation is great, and it therefore cannot be called unhealthy; indeed, from experience, it is considered quite otherwise.—*Capt. King, R.N.*

There is a marked difference of climate, between the East and West sides of Chiloe, as to the quantity of rain and wind. A proportion of both appears to be arrested (as it were) on the windward side of the heights, so that the neighbourhood of Castro, and the islands in the Gulf of Ancud, enjoy much finer weather than is met with about San Carlos.

The coasts abound in shell-fish, which afford an inexhaustible supply to the inhabitants, and are obtained with the greatest facility. Money is almost unknown, therefore nearly all transactions are by barter. Of the various ports and places we shall remark in the subsequent descriptions.

Among the numerous islands between Chiloe and the main, along the eastern coast of Chiloe itself, there are many excellent harbours where supplies of provisions may be found, except at its southern end.

The PASSAGE inside CHILOE ISLAND, by the Corcovado and Ancud Gulfs, is safe, as evidenced by the Spanish ironclad *Numancia* and two large frigates passing safely through in 1866. Here the greatest change will be observed by anyone who has come through the inner channels from Magalhaens Strait, for instead of the high, bold, rocky shore, sandy beaches will be seen almost everywhere; most of the islands are cultivated, and huts are scattered about all over them. But except to avoid a northerly wind there is little temptation to make the passage inside Chiloe Island; the rain also is almost perpetual. There are no attractions whatever at San Carlos, and the wind, weather, and barometer seem so much affected by local causes that there is frequently bad weather in the port when it is comparatively fine 50 or 60 miles to seaward.

Oysters abound, also poultry, and abundance of good potatoes can be obtained cheap at the small villages, but since a regular packet and trade have been established at San Carlos, such supplies are little, if any, cheaper than at Valparaiso.

Directions.—With strong northerly winds, a vessel having rounded Cape Tres Montes, and intending to pass inside Chiloe Island, should steer so as to pass outside Huamblin Island, and then for Huafo Island, which latter should be closed to within 5 miles before keeping away into the channel. If this be not done she will be liable to be set down by the strong tides which at times are said to run from 3 to 4 knots between Huafo and the Guaytecas Islands,

on to the dangerous lee shore of the latter group; whereas, by keeping well under the southern shore of Chiloe Island, she can haul close round for Port San Pedro, after passing the Canoitad Rocks.

Off **Olleta Point**, which is the southernmost point of Chiloe, and to the southward of the mountainous island of San Pedro, are the *Caduhuapi* and *Canoitad Rocks*, dangerous in the night or during calms. The Canoitad Rocks are 4½ miles from the nearest land, and the tide stream sets towards them.

SAN PEDRO, or HUAMBLIN, ISLAND makes at a distance like a rounded lumpy hill; when near, it appears to be wooded to the very summit, though 3,200 ft. in height. At the entrance of its harbour a white rock, near the N.E. head, may be noted as a mark; care should be taken to avoid the 3-fathoms bank, extending two-thirds across the entrance of the harbour from the South shore, if the tide is low. It is high water, on full and change, at $0^h\ 30^m$; springs rise 9 feet.

A promontory on the North shore of the harbour, in line with the next point to the westward of it, bearing W. by S., leads between the white rock and the shoal off the South side of the harbour. The best anchorage is off a sandy beach on the North shore, nearly 1 mile inside the white rock, in from 7 to 10 fathoms, sand; with the South point of entrance bearing S.E. ½ E., the white rock N.E. by E. ½ E., and the leading mark on.

Bound northward from Port San Pedro, a vessel should keep out E.N.E. 9 or 10 miles before hauling to the northward, as Laytec Shoal with only 3 fathoms water on it extends from 3 to 4 miles S.S.E. from Laytec Island.

The position of Numancia Reef is doubtful, but it is better to give Centinela Point, the S.E. extreme of Tranque Island, a good berth in case of its existence; and then haul up to pass between Chaulinec and Quehuy Islands, avoiding the positions of the other reported dangers as marked on the large scale chart, and described hereafter. There is anchorage southward of the latter island. Pass westward of Quenac Island, giving its S.W. point, off which there is a kelp patch with 3 fathoms in it, a berth of at least half a mile, then steer to pass to the eastward of Linna Island, and between Linlin Island and the shoal patches with 1¼ and 2 fathoms nearly midway between Linlin and Meulin Islands, from thence steer for Teñoun Point, southward of which is another anchorage close off a small village with a church.

Leaving Teñoun Point, the passage West of Changues Islands can be taken, and thence all is clear till Chacao Narrows are entered. If it be deemed desirable to anchor in Oscuro Cove, or Huite, the passage inside Caucahue Island is deep and clear, and excellent anchorage will be found inside the cove. There is also anchorage south-eastward of Tres Cruces Point, the N.E. extremity of Chiloe Island.

The passage above given is safe for any sized vessel, and the advantage it possesses over the wider one eastward is, that much of the strength of a

northerly wind is avoided by keeping so much under the lee of the islands, as well as a disagreeable chopping sea which gets up in the wider part.

A description of the East coast of Chiloe Island, and of the islands and dangers in the passage, will be given hereafter.

CAPE QUILAN, the S.W. point of Chiloe Island, is rounded and woody; there are cliffs in its vicinity of a light yellowish colour, about 300 ft. in height. From Cape Quilan to *Pirulil Head*, 34 miles to the northward, a similar character of coast line continues; there is no kind of anchorage, scarcely can even a whale-boat find a place of shelter where she could be hauled ashore.

Cucao Bay, 5 miles northward of Pirulil Head, is bounded by a low beach always lashed by a heavy surf. Cucao heights are remarkable, as being the highest and most level high land in the island; they are wooded to their summits, and in height from 2,000 to 3,000 feet.

"The district of Cucao is the only inhabited part on the whole West coast of Chiloe. Its Indian population are very secluded from the rest of Chiloe, and have scarcely any kind of commerce, except sometimes in a little oil, which they get from seal blubber."—*Darwin.*

Cape Matalqui, about 28 miles northward of Cucao Bay, is remarkable; the heights over it rise to 2,650 ft., and make from seaward in three summits. Off all this coast from Cape Quilan northward, there are no outlying or hidden dangers. Between Cocutue and Caucahuapi Heads, a low isthmus joins the peninsula of Lacuy to the rest of the main island.

Caucahuapi, *Guaban*, and *Huachucucuy Headlands*, are bold, cliffy promontories, needing scarcely any remarks. The latter is a high, steep, bare bluff; these three headlands are the first seen when making the land near the port of San Carlos. In approaching that excellent harbour, *Huapacho Shoal* must have a good berth; it lies $1\frac{1}{4}$ mile W. by S. $\frac{1}{2}$ S. of Huapacho Head, which is a light-coloured cliffy head, bare at the top, and broken at the seaward extremity; in the night, more especially, this shoal should be guarded against, the land behind being a low sandy beach, not then distinguishable.

Light.—On *Corona Point* is a circular white tower, 32 ft. high, showing a *fixed bright* light, varied every 2 minutes by a *flash*, at an elevation of 197 ft. above high water, visible in clear weather from a distance of from 12 to 18 miles. The tower stands on the point of Huapilacuy S.E. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ mile from Huapacho Head, with the West point of Sebastiana Islet bearing N. by E. $\frac{3}{4}$ E., the centre of Cochinos Island E.S.E., and Huachucucuy Head W. by S.

This light is seen over the land of Huapacho; vessels therefore approaching Port San Carlos from the southward, after rounding Huachucucuy Head, should continue steering to the N.E. (keeping Huapacho Point to the southward of E. by S. to avoid Huapacho Shoal), until the light bears S.E. by E., when they can haul to the south-eastward.

PORT SAN CARLOS.—The low extreme of Huapacho is sometimes called Tenuy Point; probably it extended further seaward, and was more remarkable formerly. Off it lie two dangers, *Huapacho Shoal*, before mentioned, 1¼ mile W. by S. ½ S., and *Osorio Rock*, of 15 ft. W. ¼ N., half a mile from it. There is deep water between these dangers and the rocky ground extending off the point. During the ebb tide vessels should give Huapacho Point a wide berth, as the tide sets towards the dangers at a rate of 3 to 4 miles an hour.

Dangers.—A rock, the position of which is doubtful, is said to exist two-thirds of a mile N.W. by W. ½ W. from Aguy Point, and there is a kelp patch with 7½ fathoms in it at the distance of half a mile N.W. ¼ W. from Aguy Point. *Nunez Bank buoy* is *red*, in 5 fathoms, on the eastern edge of the bank that extends between Aguy and Balcacura Points; from the buoy, Aguy Point bears N. ¾ W., and the N.W. point of Cochinos Island E.N.E. A bell-shaped buoy, painted *red*, is moored in 2½ fathoms at low water, on the northern edge of San Antonio Bank, with Aguy Point N.W., 9 cables; the telegraph on the mole of Ancud bearing S.E.; and the battery on Balcacura Head S.W. ⅓ W. On the S.W. end of the same bank is a *red* buoy, in 4 fathoms, S. ¼ E., half a mile from the North buoy, with Aguy Point bearing N.W. ½ N.; and the N.W. extreme of Cochinos Island N.E. by E.

Cochinos Islet, 200 ft. high, has two peaks on it, and a shoal of 2 fathoms extends about a mile off its East point. *Mutico Point*, at 2 miles eastward from Cochinos, has a patch of rocks lying N.N.W., 1 mile from it, and all the bottom in that vicinity is irregular; patches of kelp are seen frequently, but they seem to be attached to large stones as well as rocks. From Pecheura Point, 3 miles N.E. of Mutico Point, a rocky patch runs out about a quarter of a mile, and forms the termination of a bank extending from the shore between it and Mutico Point; and is possibly connected with the Yngles Bank.

The Port is on the South side of Lacuy Peninsula. Its entrance, between Cochinos Island and Aguy Point, is about 2 miles across, in an E. ½ S. direction, and from Cochinos Island the port extends to the westward for nearly 6 miles, with an average breadth of 1 mile.

The Town of San Carlos de Ancud, with about 8,000 inhabitants, stands on Guihuen heights, on the South shore of the entrance. It is built on two rising grounds, and in the valley that separates them a rivulet runs into the bay. A mole affords sufficient protection to the boats and periaguas frequenting the port. The houses are generally small, and have but little comfort. The plaza, or square, without which no town in Chili of the least importance is to be found, is situated on a flat piece of ground at the summit of the southern hill, and commands an extensive view. It is about 180 yards space, and has a flagstaff in the centre. Within the last few years some substantial stone buildings have been erected by the wealthy people in the town, an example which is likely to be followed. On the North side, at *Punta Arena*, there is a strong well-built stone storehouse, and opposite to it is the church, also of stone.

The Chilian Government have a store of coal at Punta Arena, and it can be easily shipped, as the point is steep-to, and the water always smooth. On the cliffs over the sea, near Ancud, very thin veins of coal have been traced, but of inferior quality near the surface.

In 1866 a fort was erected about 500 yards to the northward of the town, built with heavy baulks of timber filled in with earth, not strong enough to resist heavy artillery, but mounted with 40 cwt. 32-prs. At Aguy Point, Balcacura Head, and midway between the two places, are also forts similar in strength and construction to the one at Ancud.

Light.—A *fixed bright* light is exhibited from the crosstrees of the telegraph, situated on the upper part of Aguy Point, which should be seen from a distance of 2 miles, and is useful as a guide to the anchorage.

The anchorage off the town of San Carlos is not safe, but a vessel of not more than 12 ft. draught may stop there for a time in fine weather. In this case the best berth is in 4 fathoms water, sand and mud, with the lighthouse in line with the western angle of the fort on Aguy Point; and the S.E. extreme of Cochinos Island in line with the extreme of the point North of the town.

The best anchorage for a large ship, especially during the Norther season, is off Balcacura Point, in 7 or 8 fathoms, sand and mud; with Aguy Point bearing North, and Punta Arena S.W. by W. For a ship intending to make any stay, the best anchorage is southward of Punta Arena, in 8 or 9 fathoms, stiff dark clay.

Boats should not attempt to land at San Carlos after half ebb, or before half flood, when there is any breeze. Between these times they can go inside a small mole and land in safety, but when the water is low they can only land outside, where there is nearly always a sea with westerly winds.

Dona Sebastiana Islet, 160 ft. high, lies N.E. ½ E., 4 miles from Huapacho Point; from the islet is a shoal extending 4 or 5 miles westward, called *Achilles Bank*, over which there is considerably-disturbed water, rippling and swelling during a calm, but during a gale breaking in high short seas. This bank or ridge extends westward, in line with Chocoy Head in one with the islet; there is 6 fathoms at low water on it, at 3 miles from the islet, and 4 fathoms at 2 miles. The vicinity of both Sebastiana and *Carelmapu Islets*, a rocky chain about 2 miles long, 2½ miles to the northward, must be given a wide berth, as the tide sets strongly at times in races near them.

Yngles Bank, lying about 2 miles South of Sebastiana Island, must also be particularly avoided. It is a dangerous shoal, 3 miles long, with only a few feet of water over some parts, the bottom being sand, or sandstone, or of hard tosca, over which the tide runs with great strength. *Muller Rock*, with 12 ft. water, lies 2 miles S. ¼ W. from the peak of Carelmapu Point.

Chacao Narrows are about 11 miles long, and from 1 to 2½ miles wide, with from 10 to 40 fathoms in mid-channel. On their North side, that of the mainland, are Carelmapu and Chocoy Heads, steep cliffs, in front of which runs a

powerful stream of tide. The state of the tide, and there being sufficient wind to keep a vessel under command, are the principal points to consider when about to pass these narrows.

After passing Carelmapu Bay, keep along the North shore until Tres Cruces Point bears S.E. ½ S., to pass East of Seluian Rock, when, if going to the southward, a course may be shaped.

Topaze Rock lies 1 mile S. by W. from Carelmapu Point, with Chocoy Head bearing W. by N. ¼ N. San Gallan Point, just open southward of Coronel Point, bearing E. ⅛ N., leads South of Topaze Rock, The South extreme of Chocoy Head in line with the northern extreme of Doña Sebastiana Point, bearing W. ¼ N., leads North of Topaze Rock.

Punoun Point, on the South side of the Chacao Narrows, is low, with a sandy beach. At about 2 miles W. ¾ N. from the point is *Guillermo Rock*, said to have 9 ft. least water on it, to be nearly circular in shape, and about 1½ cable in diameter; a *bell buoy*, *striped red* and *black*, is moored in 8 fathoms, about one-third of a cable West of it, with San Gallan Point bearing E. by N.; Carelmapu Point N. by W. ½ W.; and Aguy Point lighthouse S.W. San Gallan Point, on the southern shore of the narrows, open to the southward of Coronel Point, leads between Topaze and Guillermo Rocks, but, if overlapping, they lead on Guillermo Rock.

Nearly a mile to the westward of Puñoun Point there is a rock awash at low neap tides, and another rock lies just to the westward: they are called the *Periagua Rocks*. *Prince of Wales Rock*, on which a steamer of that name was lost, is about 1 mile W. by S. ¾ S. from the West Periagua Rock, and 1½ mile from Puñoun Point. It has only 9 ft. over it. The marks for it are the extremes of Quintraquin and Puñoun Points just touching, and the N.W. extreme of Guihuen Heights just shut in with the East extreme of Cochinos Island.—*Mr. Petch, R.N.*, 1864.

The rise of tide here is about 11 ft. at springs, and 7 ft. at ordinary neaps; the soundings are very irregular. During the strength of the flood tide there is a heavy tide rip off Puñoun Point, caused by the strong stream running over so very irregular a bottom.

Lacao Bay, eastward of Puñoun Point, is a convenient stopping place for steam vessels, but care should be taken not to shut San Gallan Point in by Quintraquin Point, as the water shoals suddenly, and a reef which dries at low water springs extends nearly 4 cables N.W. by W. ¾ W. from the North end of Lacao Island. The berth used by H.M.S. *Nassau* was, with San Gallan Point just open; Carelmapu Point W. ¼ N.; and the North point of Lacao Island S.W. by S.

Petucura Rock, in mid-channel, at the narrowest part, is awash at half-tide. A line drawn from the extremity of Coronel Point to the extreme of San Gallan Point, and a line between the summit of Santa Teresa Point and the summit of Chacao Head, cross each other at the southern part of the rock. Another

rock, more dangerous to large ships than the Petucura, lies E. ½ S. from it, distant half a mile. On this rock, called the *Seluian*, there is 2 fathoms at low water. Round this and the other rock there is deep water, except to the eastward, in which direction a rocky ridge extends a quarter of a mile. The stream runs very strongly over and past them, during ebb, as well as flood tide.

San Gallan Point, on the Chiloe shore, is steep, with a remarkable clump of bushes on its summit, which is about 500 ft. high. The North shore opposite is low, except near Coronel Point, where there are cliffs, about 100 ft. in height, behind which the land rises to about 200 ft., and is thickly wooded.

Between San Gallan Point and *Santa Teresa Point* the distance is just 1 mile: it is the narrowest part of the passage from shore to shore, and half a mile farther eastward the rocks Petucura and Seluian divide the channel into two narrow passages, either of which may be used.

Chacao Bay.—Between Coronel Point and Tres Cruces Point there is deep water, about 50 fathoms; but in Chacao Bay there is excellent anchorage in about 10 fathoms half a mile N.E. of Chacao Head. When the Spaniards first settled in Chiloe, their head-quarters were at Chacao, and their vessels anchored in this bay.*

The state of the tide, and having sufficient wind to keep a vessel under command, are the principal points to consider when about to pass Chacao Narrows. A temporary anchorage may be had on the South side of the Narrows, in Lacao Bay, between Puñoun and Quintraquin Points, by getting close to the shore, and also on the East side of the latter point; and as the tide, strong as it is, sets to each side of, rather than towards, Petucura Rocks, the passage of these Narrows is not so formidable as it appears to the Chiloe boatmen.

About a mile South of Tres Cruces there is a stony point, after passing which the tide is scarcely felt; and in the Bay of Manao there is no stream of tide: near the bay the tides usually meet. The nature of the tides around Chiloe will be hereafter described.

Chilen Bluff is a low shingle point, with a remarkable tree on its extremity. About half a mile in shore the land rises suddenly to about 150 ft. *Linao Cove*, 3 miles S.S.W. of the bluff, has good anchorage in 6 fathoms. Off the N.E. point of *Huapilinao Head*, at the South side of the entrance, there is a reef of rocks extending above a mile from the point. About 4 miles from Huapilinao

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* This was formerly the principal port in the island; but many vessels having been lost, owing to the dangerous currents and rocks in the strait, the Spanish government burnt the church, and thus arbitrarily compelled the greater number of the inhabitants to migrate to San Carlos.

is the small village of *Lliuco*. *Queniao Point*, which follows, is a low stony point, with a remarkable single tree on its extremity. Shoal water extends nearly a mile off the point, 3 fathoms being found at 1 mile off. *Maypu Bank*, of 4½ fathoms, lies about 5 miles N. by W. from Queniao Point, and about 4 miles E.S.E. from Chilen Bluff.

Lobos Head, on the island of *Caucahue*, is a steep bluff, above 250 ft. high; behind it the land falls suddenly, and is very low for a short distance, after which it rises again.

Port Huite or Oscuro.—About 1½ mile south-westward of Queniao Point there is a sandy spit, with 2 fathoms of water on it about a quarter of a mile from the shore, when it deepens suddenly to 8 and 12 fathoms near the shingle spit, which forms a small but valuable harbour. This cove may become of great use, as the tide rises in it about 20 ft.; the water is deep close to the shore, and always perfectly still. The entrance is about 3 cables wide, the point of the spit steep-to; the length of the cove is three-quarters of a mile, and its breadth 3 cables. There is 7 fathoms of water within 50 yards of low-water mark, and from 12 to 16 fathoms in the middle, over a bottom of mud and sand. The West side of the entrance is a rocky point, with stones lying off it half a cable's length. A vessel should keep close to the other side. In this cove any ship might be laid ashore, hove down, or thoroughly repaired, with perfect safety and great ease. There is no similar place known on the West coast of South America; the flood tide here runs to the northward, and strongly at spring tides.

Chogon Point, a bluff point about 200 ft. in height, lies a long mile to the southward of Quintergen Point, which is low and stony, with a shoal spit of about a quarter of a mile in length. Between them lies Caucahue Strait, and in the entrance there is no bottom with 50 fathoms. Vessels bound to Oscuro Cove from the southward may pass inside Caucahue Island. H.M.S. *Nassau* passed through twice without getting bottom from the chains.

Between the Changues Islands and Quicavi Bluff there are some reefs and a tide race.

The flood tide sets close round Teñoun Point, which has a reef extending half a mile off it, and then across the channel towards the Changues Islands; the ebb tide sets to the S.W. close round the point, and at the commencement of the springs, at the rate of 2 knots.

About a mile to the southward of Quicavi Bluff lies the *Laguna of Quicavi*, which is an excellent place for boats, and when inside they can lie afloat at low water, but it cannot be entered until the tide has flowed some time.

Changues Islands.—Eastward of this cove, at the distance of 3 miles, lie the group of islands called the *Changues;* they are four in number, and separated by a channel, running nearly North and South, and 1½ mile wide in its narrowest part, in which there is from 48 fathoms to no bottom with 55 fathoms. The western island is the highest, being about 350 ft. high, and forms a ridge East

and West; the N.E. island has a round hill upon it, nearly as high as the former, but the other parts are much lower. There are some cleared patches, but they appeared thinly inhabited by Indians.

Between Quicavi Bluff and Changues Islands a ship may navigate safely, if a mid-channel course be preserved. *Pulmun Reef*, lying N. by W. ½ W., 4 miles from the western Changues, is said to dry in two places, about a quarter of a mile from each other.

Tenoun Point is low and thickly wooded, for about a quarter of a mile, when it rises suddenly to a range about 200 ft. high. There is good anchorage with northerly winds off the village on the South side of Teñoun Point. H.M.S. *Nassau* anchored with the extreme of Teñoun Point in line with the South extreme of Changues Island, bearing E.N.E.; the Church N.N.W.; Calen Point S.W. by W. ½ W.; or with the Church bearing N.N.W. three-quarters of a mile there is 10 fathoms.

A vessel proceeding to the southward from Teñoun Point anchorage should keep well on the West side of the channel to avoid an extensive shoal nearly midway between Linlin and Meulin Islands, with 8 ft. on it.

Linlin Island, which lies 4 miles to the south-westward of Teñoun Point, is low in the centre, gradually rising to a round hill, terminated by a bluff, both to the northward and southward. To the southward of Linlin is the smaller island of *Linna*.

The channel narrows gradually to the westward, as far as the N.W. point of Quinchao; it then turns suddenly to the S.W., and is not more than a mile wide. On the Chiloe shore there is a small village called *Dalcahue*, with its saw-mills; the best water in the channel runs close to the shore of Quinchao, and the deepest water is 4 fathoms. The tide runs through it about 4 knots at springs.

The channel opens out to the southward into a broad bay on each shore. On the Chiloe side lies the small cove and village of *Relun;* in the entrance of the cove there is 18 fathoms. The ebb tide sets very strongly across the Relan Reef to the S.E. towards the channel between the islands of Lemuy and Chelin; the springs rise 18 ft.

From Relan Reef to the entrance of Castro Inlet the channel is from 2 to 3 miles wide; the East entrance point of the inlet is low and stony, but a vessel may pass at a quarter of a mile off it in 12 fathoms. The western side of the entrance is formed by Lintinao Islet, to the southward of which lies the small harbour of Quinched, in which a vessel bound to Castro might wait for a favourable opportunity to go up, in case she found the winds baffling in the first two reaches; no anchorage can be found in either reach until too near the shore for safety. The village of *Quinched* is about 3 miles to the westward of the harbour; the country is well cultivated and thickly inhabited for about 3 or 4 miles on either side of Castro Inlet, and the houses are numerous, and surrounded with apple trees.

On the outer point of Lintinao Island, which is joined to Chiloe by a sandy spit that dries at low water, a stony point runs off about 1 cable to the eastward, but the South side of the point is steep-to.

CASTRO INLET.—At half a mile above the second reach of Castro Inlet, the eastern shore may be approached within half a cable, but the other side is flat and shallow for nearly half a mile from the beach, and shoals too suddenly for a vessel to go by the lead; in working up or down, a vessel should keep the former aboard, not going farther than two-thirds the breadth of the channel.

The eastern shore is composed of steep wooded slopes; the western rises gradually from the beach. At 2 miles from Castro, on the Chiloe shore, there is a small cove where vessels might anchor, if necessary; but there is 20 fathoms between the points, and it shoals suddenly a little inside of them. The point of Castro is a level piece of land, about 100 ft. above the sea, running out between the small harbour to the northward, and the River Gamboa to the southward; it terminates in a low shingle point, which is steep-to on its North side, but to the southward of it a flat commences, which follows the western shore all down that reach of the inlet. The small harbour to the northward of the point is half a mile in length and one-third of a mile wide; between the points there is 7 fathoms, but it shoals gradually to 3 fathoms about a quarter of a mile farther in. The best anchorage is nearest to the South point, as the North side is shoal for about a cable's length off. In running for the harbour, a vessel should keep the eastern shore aboard till she is abreast of it, when she may stand across, and will thus avoid the shoal to the southward of Castro Point, which extends a mile off.

CASTRO stands near the outer part of the level point; "the city" consists of three short streets of 200 wooden houses. There are two churches, one of which belonged to the Jesuits, has been a handsome building, but is fast falling to decay, and is shored up on all sides; the other also appears to have been well built, but is now nearly in ruins; altogether Castro has been much neglected, and the people are poor. Between San Carlos and Castro, 37 miles distant, is an artificial road. The road itself is a curious affair; it consists in its whole length, with the exception of a very few parts, of great logs of wood, which are either broad and laid longitudinally, or narrow and placed transversely, the longitudinal logs fastened down by transverse poles pegged on each side into the earth, rendering a fall rather dangerous.—*Mr. Darwin*, 1834.

The tide at springs does not run above 1½ knot in the strongest part, and at neaps it is felt very little.

Opposite to the entrance of Castro Inlet, on the North shore of Lemuy, is *Poqueldon*, the principal village on the island. The landing is bad; the tide at high water flows close up to the trees; and at low water the shores are very muddy.

Yal Bay and Point.—Off the *Point of Yal*, on the Chiloe shore, there are two small, low shingle islands; they are connected by a spit, which is covered at high water. A mile to the S.E. of Yal Point there is a bluff head, which forms the North of *Yal Bay;* and a little inshore of the point there is a remarkable flat mound covered with trees. Half a mile inside the bluff lies the entrance of the small harbour of Yal. There is no anchorage in the bay until within a quarter of a mile of the head; it is not a fit place for vessels to anchor in unless obliged to do so.

The S.W. extreme of *Lemuy Island*, called Detif Point, terminates in a perpendicular cliff, about 150 ft. high, surmounted by a round hill 250 ft. above the sea. About 3 miles to the N.E. of Detif Point the same headland throws out *Abapon Point*, with a reef extending to the eastward 3½ miles; near its outer edge there is a rock always dry, and at low water the reef uncovers for about a quarter of a mile on each side of it. No vessel should attempt to cross this reef, although there is 9 ft. at low water between it and the shore, because the tide sets over it strongly and irregularly.

Between the S.E. point of Quinchao Island and Abapon Point lie the islands of *Cheli* and *Quehuy;* the N.E. extreme of the latter is called Imeldeb, and is connected with it by a narrow isthmus. Off this point, for a mile to the S.E., there is a shingle bank that dries at low water, on which a French ship struck, and which very considerably narrows the channel between Imeldeb and Chaulinec. There is good anchorage off the South side of Quehuy Island, in 7 to 10 fathoms, sand, about half a mile off shore, with the extremes of Quehuy Island bearing North and S.W. by W., and the West point of Chaulinec Island N.E. ½ E.

About half a mile S.E. of Chaulinec Island there is a reef that breaks occasionally at low water, on which a schooner was recently lost. Besides *Chaulinec*, there are two smaller islands lying to the eastward of Quinchao Point, called *Alau* and *Apiau;* and reefs extend off the North end of both of them, from the latter as far as 2½ miles. At the S.W. end of Alau, close to the entrance of the channel, between it and Chaulinec, there is a small harbour or cove. South-eastward of Linlin and Linna, and midway between Quinchao and Changues Islands, lie *Meulin*, *Quenac*, *Cahuache*, and *Tenquelil Isles;* on Cahuache there is a round hill, 250 ft. high, which commands a good view of the neighbouring islands, and the most cultivated part of the archipelago. *Tiquia Reef*, which lies from 2 to 3 miles East of Cahuache, is about 3 miles in length, N.W. and S.E., half a mile broad, and dries at low water. To the eastward of Chaulinec Island lie the Desertores.

The Desertores.—The largest of these islands is called *Talcan;* it is 9 miles long and 4 miles broad, and has a deep inlet on its S.E. side. Just outside the entrance a bay is formed between the points, in which lie several patches of rocks, which dry at low water; a small channel leads into the bay to the northward of them, which is visited for fishing in the season.

Many scattered rocks lie off the S.W. and southern part of the island to the distance of a mile, and off its North point a shoal extends as far as 1½ mile, with 4 to 6 fathoms on it. At 2 miles from the point there is a rock about 10 feet above the sea, on which many seals rest. Vessels seeking anchorage among these islands should be cautious in approaching them, in consequence of the rocks before named.

The smaller islands, *Chulin*, *Chiut*, *Nihuel*, *Ymerquina*, and *Nayahue*, do not afford any shelter for vessels, except off the North end of the latter, which is divided into two islands by a narrow boat channel, with from 2 to 10 fathoms in it. Some rocks lie half a mile off the S.E. point. A reef, probably awash at low water, is reported to lie about 2 miles S.W. of Chiut Island. On the main land, abreast of the S.E. point of Talcan, is *Mount Vilcun*, a remarkable sugar-loaf hill, which rises direct from the water's edge, and is thickly wooded to the summit; to the southward of it there is a deep inlet, with an islet at its mouth. About 14 miles to the E.N.E. of Mount Vilcun is the volcano of *Minchinmadiva* or *Chayapiren*.

About 5½ miles S.W. ½ S. from the West point of Nayahue are the *Solitaria*, some small rocky islets surrounded by a reef.

Returning again to the main island of Chiloe, *Ahoni Point* lies opposite to Detif Point. *Lelbun Point* lies about 4 miles from Ahoni; and abreast of it the shoal widens to nearly 1½ mile, and is covered with patches of kelp. The ebb tide sets to the S.E. about 2 knots at springs off Ahoni Point.

Aytay Point, about 3 miles southward of Lelbun Point, is low and rocky. Some rocks of a reef which runs out from it dry about 2 miles from the shore, and about 3½ miles northward of the point is a shoal with 13 ft. on it at low water, about a mile in extent. *Quelan Point* is a long, narrow strip of land, very low, and covered with trees. At 3 miles to the eastward of the point is the small island of *Acuy*.

Numancia Reef is reported to lie about 2½ miles north-eastward of *Centinela Point*, the East end of Tranque Island, and about 9½ miles off in the same direction the captain of the Italian corvette *Vettor Pisani*, 1883, reports a shoal of 8 ft., sand and gravel, marked by weed, and about a mile in extent. A rocky shoal, partly uncovered at low water, is said to lie 4 miles westward of this latter danger.

Quelan.—The channel between Quelan Point and the Island of Tranque is about a mile wide; and the ebb sets through it to the westward about 2 knots at neap tides. After rounding the Point of Quelan, by keeping along the inside of the spit it will lead to the small harbour or cove of Quelan, the entrance to which is about half a mile wide; but the shores on either side should not be approached within a cable's length, at which distance there is 3 fathoms, and 13 fathoms in mid-channel.

The cove is about three-quarters of a mile long, and the same broad, but the West side is shallow for a quarter of a mile; the edge of the shoal is in a line

with the shingle point, on the eastern side of the entrance; but in every other part of the cove there is good anchorage in from 5 to 8 fathoms, with 3 fathoms a cable's length off the beach.

About a mile to the westward of the cove is the small bay of Quelan, with an island off it, which affords anchorage in from 10 to 13 fathoms. The *flood tide* runs close round the points, and then strikes across towards the North shore, outside the small island, within which there is very little tide; in the narrow channel it runs at least 4 knots at neap tides, sweeping round the rocky points. In the Chiloe shore, abreast of the N.W. end of Tranque Island, there is a deep inlet, called *Compu*, and a little to the eastward of it a smaller one, neither of which were examined.

Off the entrance to the S.W. channel, between Tranque Island and Chiloe, there is a small island called *Chaulin*. About 1 mile from Cuello Point on the Chiloe shore, in the direction of the West point of Chaulin, there is a stony reef, extending in a N.W. and S.E. direction about half a mile.

Huildad Inlet.—At 5 miles S.E. by S. of Cuello Point lies the *Inlet of Huildad;* its entrance is only 150 yards wide, but is wider within. In the outer harbour there is good anchorage in from 5 to 9 fathoms: the shores are steep-to, except along the bend behind the shingle spit, which is shoal for about 1½ cable from the beach. On the South shore stands the church, with three or four houses round it, the remainder (there were about twenty in all) are scattered along the sides of the harbour.

The *tide* at the entrance runs on the ebb at spring tides nearly 4 knots, but inside it slackens considerably. Should a vessel wait in Huildad for a change of wind or weather, the outer harbour would be the best, as N.W. gales blow very heavily down the upper harbour, while in the outer one a vessel would be sheltered from every wind.

To the southward of Huildad, between it and Chayhuao Point, a shoal extends above a mile from the shore, nearly covered with kelp, and terminating in a long stony reef, which runs off Chayhuao Point to the S.E. On its outer edge the tide runs about 1½ knot at springs. There is a channel between its South end and the N.E. side of Caylin Island. The reef commences half a mile inside the outer point, and deepens suddenly to 7 and 12 fathoms; at a quarter of a mile inside the reef on the Chiloe shore there is 27 fathoms within half a cable of the beach. The flood tide sets to the East in the channel across the reef at least 3 knots at springs: after passing the reef it meets the outside tide coming from the southward. Between Chayhuao Point and San Pedro passage there is a deep bay, fronted by the islands Caylin, Laytec, and Colita, with the small cove of Yalad to the N.W. of the latter.

Caylin is called here "El Fin de la Cristiandad," the termination of South American christendom. Here is an Indian village, with about forty houses, containing about 250 inhabitants, who were glad to supply Captain FitzRoy's party with sheep and poultry in exchange for tobacco and handkerchiefs;

they seemed anxious to know when the King of Spain would retake the islands.

Laytec Island is 6 miles long N.W. and S.E., and about 3 miles in breadth, and is separated from Caylin by a channel 2 miles across; off its S.E. extreme are a few rocks. A dangerous shoal, on which the least water found by H.M.S. *Nassau* was $2\frac{3}{4}$ fathoms, and where the sea breaks heavily with S.W. gales, lies $2\frac{1}{8}$ miles S.E. of Laytec Island.

Colita Island is low and thickly wooded, about 4 miles long and $1\frac{1}{2}$ mile broad; the channel between it and Chiloe is very narrow, and apparently not fit for a ship. Between Colita and Laytec Islands the passage is $1\frac{1}{2}$ mile broad. The tides set about 1 knot through the channel North of the islands.

Directions for passing through the passage eastward of Chiloe Island are given on page 123.

COLONY OF LLANQUIHUE.—At the head of the Gulf of Ancud is the *Gulf of Reloncavi*, to the northward of which is a level tract between the Cordillera of the Andes and the coast range, and which contains the principal lakes of this portion of South America, that called Llanquihue, 141 ft. above the sea level, being the chief. The shores of the gulf are densely timbered, and have been the chief source of that material for the northern portions of the republic. The land in the rear is less wooded, and here, in October, 1853, an agricultural colony was established by Don Manuel Montt, the then president of the republic, under the title of the Colonial Territory of Llanquihue, and a portion of the State of Chiloe and Valdivia were separated to form it. A number of German emigrants arrived here in 1853-54 (in the latter year there were 1,344, which, with the native settlers, made a population of nearly 5,000). At *Puerto Montt* the produce of the colony is shipped. There is a cart road from it to the agricultural settlement. Wheat, oats, potatoes, and vegetables are grown.

At 6 miles East of Chacao Narrows lies *Abtao Island*, $2\frac{1}{2}$ miles long and 1 mile broad; the N.W. point is the highest, and ends in a bluff, 80 ft. high, off which a stony flat runs 2 cables' lengths; close to the flat there is 12 fathoms, and a quarter of a mile to the N.E. 30 fathoms; the shoal from the main runs off nearly a mile. From the S.E. end of Abtao a shoal extends $1\frac{1}{4}$ mile, with 5 fathoms near the extremity.

Lagartija Channel, between Abtao and Carba, is marked by two *red buoys*, one on the S.E. extreme of Abtao Spit, and the other on the eastern side of the channel, $1\frac{1}{4}$ mile North of it.

Abtao Channel, navigable, at low water when the banks show, without a pilot, at its northern part is about 6 cables across, and on the western shore is a small bay named *Port Abtao*, which affords anchorage in from 10 to 20 fathoms. During the year 1866 a small squadron belonging to Chile and Peru found secure anchorage at Port Abtao.

At $1\frac{1}{2}$ mile N.E. of Abtao lies the small island of *Carba* or *Lagartija*, a round

hummock, about 200 yards long, surrounded by a bed of shingle; a shoal extends a mile off its S.E. end, and at 1½ mile to the south-eastward of the island there is a sunken reef, on which the mail-steamer *Valparaiso* was lost in February, 1872. At 2 miles eastward of Carba lies the N.W. edge of *Lami Bank*, always dry in several places; the North side is about 2 miles long, and runs parallel to the shore, at the distance of about 1½ mile; in mid-channel there is 35 fathoms. The passage between the Islands of Quenu and Calbuco is about three-quarters of a mile wide, with 21 fathoms in mid-channel; the points of both islands are low. A rocky flat runs off the *Point of Quenu*, but it does not quite bar the channel.

Calbuco (or *El Fuerte*), situated near the N.E. end of Calbuco Island, on a steep slope, is a small town where wood is collected for shipment to Port Montt. The beach of El Fuerte dries at low water, about a cable's length, and close outside there is 6 fathoms, and a very little farther 17 fathoms; the channel then deepens to 24 fathoms. The best anchorage is abreast of the town, about a third of a mile distant, and in from 20 to 22 fathoms, muddy bottom. The mail steam vessels touch here to and from Port Montt.

Huito Inlet is about 4 cables wide at the entrance, and extends from Port Calbuco in a West, N.W., and northerly direction about 4 miles, with a depth of 18 fathoms at its entrance, decreasing gradually to 3½ fathoms at the distance of a mile inside, and nearly abreast of El Rosario on the North shore, off which, and the first projecting point on the South shore of the inlet, are banks extending out, narrowing the channel to about a cable's length across. After passing the shoal water off El Rosario, the depth increases to 20 fathoms, from thence it decreases gradually to the head of the inlet. A vessel may anchor in mid-channel just inside the entrance of Huito Inlet in 14 to 17 fathoms. There is also anchorage to the westward of El Rosario in from 12 to 20 fathoms, sandy bottom.

Puluqui Island is thickly wooded; on the East side the patches of clear land are very few, but on the West side, where the land is lower and swampy, they are more numerous. *Soldado* or *Centinela Point*, the southern extremity of Puluqui, is a low shingle spot, thickly wooded; the high land rises about 200 yards in shore, and a flat extends a cable's length from the point. About a mile to the northward there is a small cove, the entrance of which is very narrow, and too shallow for a boat after half-tide, but inside it is half a mile across, with 8 fathoms in one part. Between the North end of Puluqui and Tantil Island, off the mainland, is a narrow channel with 5 to 7 fathoms in it.

Chidhuapi Island, to the westward of Puluqui Island, is low, and nearly all cultivated. The *Island of Tavon* is composed of a number of detached hummocks of land joined together by low shingle spits, some of which are overflowed at high water. Half a mile to the N.E. of its western extremity, a stony reef runs to the northward, in the direction of Lami Bank, and is dry at

low water three-quarters of a mile from the shore. Another reef runs off to the south-westward, to the distance of a mile.

Amnistia Bank is an extensive rocky shoal lying about 3 miles to the southward of Tavon Island with 12 ft. on it at low water springs.

RELONCAVI SOUND.—Off Aulen Point, on the main shore, lies *Cullin Island*, about 3 miles long East and West, and 2 miles North and South; between it and the S.E. point of Puluqui Island is the entrance to *Reloncavi Sound*, which extends 20 miles to the northward, and about 12 miles across, from East to West. At 1½ mile northward of Cullin is *San José Shoal*, but there is a clear space of 3 miles between it and Puluqui Island.

Huar Island, containing a population of over 1,000, lies on the West side of the sound, and to the S.E. of it are two shoal patches, *Pucari* and *Rosario;* the eastern side of the latter lies 3 miles from the island. As far as information could be obtained, there is no bottom with 120 fathoms throughout the sound, except in the neighbourhood of the islands and shoals; anchorage may be found under both the former, and doubtless along the shores on either side, according to the prevailing wind. In the entrance, between Cullin and Puluqui Islands, there is no bottom with 60 fathoms.

PORT MONTT is the seaport of the German colony before mentioned, which is chiefly established at Lake Llanquihue, 15 miles to the northward. At 5 miles northward of Huar Island, and on the West side of the sound, is *Mayllen Island*, leaving a passage inside it, and at 4 miles North of it is *Tenglo Islet*, separated from the coast by a narrow passage, at the North end of which is Port Montt. The anchorage is good, but open to the southward. H.M.S. *Topaze*, in 1869, however, moored in the Dique or passage between Tenglo Island and the main, and remained with a hawser to the shore, having room to swing one way. The road to the colony lies through the pine forest of Alerse, which is largely cut and exported. The P.S.N. Company's steamers call here every month. The population of the town of Port Montt consisted, in 1872, of 2,030 inhabitants.

It is high water here, on full and change, at $0^h\ 48^m$; springs rise 18 to 20 ft., neaps 14 to 15 feet.

Mr. J. A. R. Petch, R.N., who was here in H.M.S. *Shearwater*, August, 1864, says of it:—

Port Montt is now a flourishing town, with nearly 2,000 inhabitants, 800 of which are Germans. The principal export is timber. The *Shearwater* anchored on the bank which extends 1 mile southward of the town, in 17 fathoms, fine dark sand, with the N.E. extreme of Toengoes (Tenglo) Island S.W., the West extreme of the town N.W. ¾ W., and the cemetery N.E. ¼ E. The bank is very steep-to, and should be approached with caution, for the beach at low water springs dries more than 2 cables, and then suddenly drops in 7, 10, and 15 fathoms, and should the anchor be dropped in less than 15 fathoms, with a

long scope of cable out, the vessel would probably tail on to the beach with southerly winds.

The mark for being on the bank, and a good one for anchorage, is the low shingle beach at the extreme of the little harbour (formed by the N.E. end of Toengoes and the main) touching the dark house to the southward of it. This little harbour has 4½ fathoms in it, fine sandy bottom, and is sheltered from all winds. The Pacific Steam Navigation Company's steamer's always anchor in it, and beach their vessels for repairs, &c. There is no room for moderate sized vessels to swing, consequently they must make fast astern with a hawser to the shore.

Directions.—The following is by a German pilot, Pedro, who took H.M.S. *Shearwater* through in 1864.

The passage through Chacao Narrows and to Port Montt should never be taken without a pilot. The route taken by steam vessels, after clearing the Narrows, is between Abtao and Carba Islands, to the North of Lami Bank, then between Calbuco and Quenu Islands, to the town of Calbuco; but at high water between Calbuco and the main; then along the N.W. side of Puluqui, between it and Tantil, and along the West side of Huar to Port Montt, passing East of Mayllen and Toengoes Islands. Sailing vessels after clearing the Narrows generally pass South of Tavon Island and between Puluqui and Cullin; but great care must be taken to avoid Amnistia Bank, about 3 miles southward of Tavon Island.

Southward of the reef off the South end of Carba the shoal patches, before described, must be particularly guarded against. The shingle spit off the North extreme of Carba may be approached to 2 cables. The spit does not run off more than a cable from the N.W. extreme of Quenu, leaving a clear passage of two-thirds of a mile between it and the South extreme of Calbuco. Tantil Island is connected to the main by a shingle spit which dries at low water. There is anchorage on the West side of Huar Island, off the high bluff headland, in 13 fathoms, sandy bottom, about one-third of a mile off shore. In passing through Huar Passage, guard against a shallow spit which extends nearly half a mile from the N.W. side of Huar.

There is a deep inlet on the eastern side of Reloncavi Sound, by way of which and the River Raleon or Petrohue, through Todos Santos Lake, and up the Peulla, a communication was formerly kept up with the Spanish missionaries' settlement on an island in the great Lake of Nahuelhuapi; which mission was abandoned towards the close of the last century.

The VOLCANO of OSORNO, or *Purraraque*, or *Huenauca*, rises to about 7,400 ft. above the sea level, and is 30 miles to the N.N.E. of the head of Reloncavi Sound. This mountain is most striking in form. It is not only quite conical from the base to the summit, but it is so sharply pointed that its appearance is very artificial. When seen from the sea, at a distance of 90 or 100 miles, the whole of the cone, which is covered with snow, stands out in

the boldest relief from among ranges of inferior mountains. The apex of this cone being very acute, and the cone itself regularly formed, it bears a resemblance to a gigantic glass house, which similitude is not a little increased by the column of smoke so frequently seen ascending. It is one of the indications of what is the actual physical condition of the country; and its eruptions and actions are intimately connected with those tremendous convulsions which we shall have to allude to in the description of Valdivia, Concepcion, and other places to the northward. Between Osorno and Port Montt is *Calbuco Volcano*, rising to a height of 5,548 ft. above the sea.

At 19 miles to the S.E. of the entrance to Reloncavi Sound is the entrance of *Comau* or *Leteu Inlet*, extending about 17 miles to the S.E., with deep water.

TIDES.—The tide wave from the ocean sets against Chiloe and its vicinity from the westward. The body of water impelled round the South end of this large island drives the water of Corcovado Gulf northward into those of Ancud Gulf, at the N.W. point of which they meet the stream impelled through the Narrows of Chacao. Very little stream is felt in the gulfs, but there is a considerable rise and fall, from 10 to 20 ft., and more or less stream along shore and among the islands.

The tides on the East coast of Chiloe are very irregular, being much influenced by the winds. The time of high water at Castro, and other places, is earlier in going to the southward; yet at Huildad, which is more than 30 miles South of Castro, it was high water three-quarters of an hour later than at Castro; but at the time it was blowing a heavy N.W. gale at Huildad. The average time of high water in the North part of the Archipelago is probably about 1 o'clock, on full and change days, which decreases gradually to about $12^h\ 15^m$ near the South end. It appears to be never regular, as it was found to vary half an hour in two following tides.

The rise was also very irregular, as the tides often rose higher when they were taking off. The night tides were always higher than the day.

In Port Oscuro the rise and fall at one time at dead neap tides were 18 ft., and the next springs it only rose 16 ft.; by the marks on the shore the greatest rise and fall are at this place, and it is the best for heaving down in the gulf, or for cutting docks, if they should ever be required. The only other place that would answer well for that purpose is the outer part of Huildad Inlet, on the West side of which there is 9 fathoms close to the shore, and the coast is composed of rock, which would answer better than the sand and shingle of Port Oscuro; but the rise and fall are only 15 ft. at spring tides, which would be too small for large ships. Port Oscuro may, therefore, be considered preferable.

CHAPTER V.

THE COAST OF CHILE, FROM SAN CARLOS TO THE BAY OF MEXILLONES.

The Republic of Chile extends from the ridge of the Andes to the Pacific, its width varying from 40 to 200 miles. In 1876 its northern boundary was determined by the Chilian and Bolivian Governments to be in lat. 23° 58′ 12″ S., or about 5 miles southward of Jara Head; a white beacon on the shore marks this position, but the boundary is now fixed at Mexillones, in lat. 23° S. From thence it extends to the southward to Cape Horn, including the coast of the Strait of Magalhaens to Cape Virgins at the Atlantic entrance, thus having a length of about 2,270 miles, and an area of about 220,000 square miles. Santiago is the capital, and Valparaiso the principal port; according to the census of 1875, the former then had a population of 148,264; it now amounts to about 150,000.

It is divided into nineteen provinces, and two colonies (one of which is the Strait of Magalhaens), and contained, according to the census of the end of 1856, 1,439,120 inhabitants, without reckoning the Indians. In 1875, the population was numbered at 2,068,424, which, together with about 44,000 Araucanian Indians and Patagonians, makes a total of 2,112,424. In 1882, the population was estimated to amount to 2,234,000. For customs jurisdiction the maritime portions are divided into seven districts, having the chief ports as their centres, which need not be here specified.

In the beginning of 1879 war broke out between the united republics of Bolivia and Peru, and Chile. It is probable that on the settlement of this quarrel, in which Bolivia and Peru have thus far been worsted, some alteration of the boundaries may take place.

There is a marked difference in the appearance and climate of the northern and southern parts of Chile. In the South, vegetation is abundant and luxuriant; in the North, the sea-coast has an irreclaimable barren appearance, very repulsive to an eye accustomed to woodland scenery. Chiloe, as before stated, is exposed to an excessive amount of rain. About Valdivia the climate is similar, and must always be an obstacle to cultivation. Northward of Valdivia, towards Concepcion, is one of the finest countries in the world, in a very healthy climate.

In the southern part, the surface is not formed by a series of table heights (as in the North), reaching from the sea to the Cordilleras; but it is a broad expansion of the mountainous Andes, which spreads forth its ramifications from the central longitudinal ridge towards the sea, diminishing continually but irregularly till they reach the ocean.

The ANDES, which form so important a feature in the physical condition of South America, commence in the South part of continental Chile, the connected chain which extends northward to the furthest extreme of the continent. One of the southernmost peaks in this part is the volcano of Osorno, mentioned on page 139. The range southward of this forms a series of detached peaks along the East side of the Gulf of Ancud, and may be traced southward, at a minor elevation, to Cape Horn, which is its South termination, varying here from 5,000 to 9,000 ft. high. North of this, the Chilean Andes attain a mean elevation of 13,000 or 14,000 ft., rising with an extremely sharp ascent from the plain below.

The principal point of interest to the mariner respecting these mountains is their aspect from the offing. Admiral FitzRoy says :—"There is an effect in these lofty mountains, which seem to rise abruptly, almost from the ocean, which charms one for a time. Just before sunrise is generally the most favourable moment for enjoying an unclouded view of the Andes in all their towering grandeur; for scarcely have his beams shot between their highest pinnacles into the westward valleys, when clouds of vapours rise from every quarter, and during the rest of the day, with few exceptions, obscure the distant heights."

The snowy summits of the Andes are seen far off at sea, sometimes long before the lower lands near the shore become visible. And this has a peculiar effect at times, as in 1860, when it was announced that a white island, 15 or 20 miles long, and 200 or 250 ft. high, had been seen 20 miles off, and 85 miles off shore, between Valparaiso and Coquimbo. This must have been one of the peaks which were then at least 170 miles distant.

The principal peaks are Osorno, Villarica, 16,000 ft.; Antuco, at which is the southernmost Chilean Pass; Chillan, Tupongati, or Tupungato, Anconcagua, Limari, and numerous others, most of which are volcanoes more or less in activity. Their appearances, when observable from seaward, are noticed hereafter. In the ensuing chapter a brief sketch will be found of this great chain of mountains. From the volcanic nature of the Andes, the whole of this region is liable to earthquakes. Some notice of their devastations are given in subsequent pages; and it may be observed, that through their agency great alterations may be effected, not merely in the actual condition of the harbours and coast, but in the state of the inhabitants.

The rivers of Chile, as will be evident, are unimportant. In the middle and southern provinces they are sufficiently numerous. The North part of the country is scarcely watered by any; and from the Maypu to Atacama, a distance

of 1,000 geographic miles, all the streams and rivers together would not make so considerable a body of water as that with which the Rhone enters the Lake of Geneva, or as that of the Thames at Staines. They are quite useless for navigation, but serviceable for the purposes of irrigation.

From this cause, the southern provinces are those devoted to agricultural industry, cattle breeding and the raising of grain being the chief employments. In the North part mining is the most important commercial pursuit, and for which Chile is best known. Chile is almost the only Spanish Republic of South America which is improving; and the good administration of the government promises continued prosperity. A great impetus has been given to the trade in recent years by the construction of railways from the ports of Caldera, Coquimbo, Valparaiso, Talcahuano, &c., to the interior, thus opening up the country to mining and other operations. The principal ports are also now in *telegraphic* communication with Europe, and with each other. Vessels entering Chilian ports pay once in each calendar year Hospital and Light dues, amounting to 10 cents per ton register for each class. In 1874 the exports from Chile to Great Britain were valued at £4,451,946, chiefly consisting of copper, to the value of £1,412,742, and wheat £1,291,589. The imports for the same year from Great Britain amounted to £3,450,290. In 1881 the exports to Great Britain amounted to £2,730,519, and the imports £2,686,844.

The COASTS of the southern part of Chile, including the Island of Chiloe, have been described in the preceding chapters.

Sebastiana and Carelmapu Isles.—Continuing along the coast from Chiloe, northwards, the islets of Doña Sebastiana and Carelmapu require another notice, in order that their vicinity may be widely avoided. The tide sets strongly at times in races near them; and when there is a swell from seaward with an ebb tide running, the short high sea north-westward of these islets is very straining to a ship, as well as dangerous to boats or even to small vessels. Corona Head should always be closed, but Doña Sebastiana avoided. There is water for any ship between Sebastiana and Chocoy Head, avoiding the sand-bank half a mile from the East point of the island, as well as to the eastward of the Carelmapu Rocks, but should not be attempted. Carelmapu Islets should not be approached from the westward within 3 miles, and it will be but prudent to give them a berth of more than 4 miles.

Between the North extreme of Chiloe Island and Godoy Point, 17 miles to the northward, lies *Choronades Gulf*, into the N.E. corner of which flows the *Maullin River*, one of the most important rivers in the Chilian Republic, having its source in Llanquihue Lake, near the foot of the Andes. The river is navigable for 26 miles from its mouth for vessels of not more than 9½ ft. draught; but small boats with short oars can go 20 miles beyond. The approach to the river from seaward is a shallow, wild place, exposed to a heavy breaking sea, and unfit for vessels except during fine weather.

Port Godoy lies in the shallow bay between Godoy Point and the entrance

of Maullin River. It is badly protected from the prevailing southerly winds, but accessible in fine weather. The landing-place is in the N.W. corner of the bay. At about 1½ mile north-eastward of Godoy Point is a precipitous head, called Varillasmo, from which a sandy spit extends eastward with shallow water, which should not be approached nearer than 1 mile. The anchorage is in 4½ fathoms, gray sand. Wood, water, fish, &c., can be procured from the houses near the landing-place.

Godoy (or *Quillahua*) *Point* is wooded near its summit, but low and rocky at its base, off which dangerous rocks extend,* rendering the head dangerous to approach within 2 miles.

From Godoy Point the coast trends N.W., 8 miles to *Estaquillas Point*, and 25 miles beyond this to *Cape Quedal*, a projecting and bold promontory; under a height which is very conspicuous (a part of the range called Parga Cuesta) is a point called *Capitanes*, 9 miles to S.S.E. of Quedal.

Parga Bay, 1½ mile S.E. of Estaquillas Point, is well known for the excellence of the coal found in its neighbourhood. The bay is of little importance, being only of small extent, with the entrance foul, and not more than 65 yards wide. According to the opinion of pilots, it is sheltered from all winds, but being scarcely seen from the offing cannot be entered without their assistance. South of Parga Bay is a small creek with a sandy shore, called *Playa del Carbon*.

Llico Bay, 3 miles to the northward of Estaquillas Point, is exposed to a heavy swell, and without shelter. *Rio Llico*, at the head of the bay, is said to be navigable for a distance of 20 to 22 miles, and contains plenty of fish. The bar at its mouth breaks heavily, and cannot be approached with boats of any description.

Natives report the existence of a small creek, called *San Luis*, 5 miles southward of Cape Quedal, where boats can find shelter, but the entrance is said to be full of stones, and should not be attempted without local knowledge.

At 7 miles N. ¼ W. from Cape Quedal is Cape San Antonio. Between these capes the coast forms the bay of *San Pedro*, recommended as the only place affording shelter from the prevailing winds along the coast for a distance of 140 miles, or, from the Gulf of Ancud, to Corral. It is of moderate depth, with sandy bottom, but exposed to a heavy swell. The best anchorage is in 7 to 8 fathoms, sand, with the northernmost of San Pedro Rocks, in the S.W. part of the bay, bearing West. In the bay are four creeks, of which Huayusca

* Most of the projecting points on the coast between Godoy and Galera Point, in lat. 40°, have many detached rocks about them, all close to the shore, and the greater part above water. The land is high and bold, without any outlying danger; but at the same time without a safe anchorage between San Carlos and the Port of Valdivia. Soundings extend some miles into the offing, though the water is deep. At 2 miles to the westward of this shore there is usually about 40 fathoms water; at 3 miles about 60 fathoms; and at 5 miles from 70 to 90 fathoms, over a soft sandy and muddy bottom.

and Manzano are the most important. Huayusca is the more central or southern, and has a river terminating in it. At its entrance is a rock and small shoal. It has been stated that vessels in this creek have ridden out violent gales. Lliuco River, inaccessible to boats, enters the N.E. corner of the bay.

San Pedro Point, the western extremity of San Pedro Bay, is steep and moderately high. North of it are some sunken rocks, extending 1½ cable off shore. Nearly a mile West of it is a triangular group of rocks, forming with the coast a narrow and clear channel, with 9 to 10 fathoms water. From the N.E. extremity of these rocks, Cape San Antonio bears N. by W., and from the southern extremity Cape Quedal bears S.W. by S. ½ S.

Cape San Antonio is a high, bold headland, dark coloured, and wooded; the land hereabout ranges from 1,000 to over 2,000 ft. in height.

Condor Cove, 8 miles North of Cape San Antonio, affords shelter from southerly winds, but is exposed to winds from the westward. The best anchorage for steam-vessels is in 9 to 10 fathoms, and for sailing ships a little further outside, in order to be in a position to weigh from at the first signs of bad weather. *Chalhuaco River* enters the sea 1 mile North of Condor Cove. The banks of this river are well wooded, and produce excellent timber.

Cape Compass, rocky, precipitous and well wooded near the summit, is 3¼ miles N.W. from Condor Point, and is the most conspicuous headland between Cape Quedal and Galera Point. A third of a mile off this cape is a depth of 12 to 17 fathoms, sand. *Ranu Cove* lies immediately East of Cape Compass; its South side offers some shelter for ships during southerly winds in 10 to 11 fathoms. There is no landing in any part of the cove. *Muicolpue Cove*, 9 miles North of Ranu Cove, affords good shelter in 11 or 12 fathoms, sand, during southerly winds, but quite exposed to westerly winds, which cause a heavy sea. *Manzano Cove* is in the bight North of Muicolpue, its eastern shore consists of yellow sand. The roadstead is badly sheltered, and landing dangerous, which is also the case at Banderas Bay, 12 miles to the northward.

Covadonga Rock, on which the sea breaks occasionally, is 2½ miles S. ½ E. from Pucatrihue Point, and 1½ mile W.S.W. from Pulome Point. One-third of a mile North, South, and West of the rock, 27 and 28 fathoms was obtained, with rocky bottom.

Milagro Cove, about 7 miles northward of Pucatrihue Point, is sheltered from the southward, but the anchorage is not good; the best is in 9 fathoms, sand, with the southern point bearing S. ½ E., and the East part of the sandy shore S.E. by E. ¾ E.

The River Bueno is navigable within, and flows through a valuable tract of country, but there is a bar at its mouth, about 5 miles northward of Milagro Cove, which excludes all but the smallest craft. It takes its rise in the chain of lakes lying at the base of the Andes, and at about 40 miles from its entrance

is the town of La Union. The trade of the river has been developed by small steam-boats, not drawing over 8 ft. It is reported as navigable for 50 miles up.

Signals.—The following signals were established for crossing the bar of Rio Bueno, in 1876, viz.:—

A white flag at the signal mast-head indicates the bar is clear. A man holding a white flag vertically, that the channel will be found in the centre of the bar. The same flag inclined to the right, that the channel is to the North; and inclined to the left, that the channel is to the South. A red flag indicates that the bar is impassable, and that no attempt should be made to cross it. A blue flag, with a diagonal white cross, at the mast-head, denotes that vessels must remain outside the bar till half-tide.

If the signals be made from a small vessel in the river, she will indicate the direction of the channel, and should be steered for.

If no signals are shown, the vessel approaching the river has not been seen, and should fire a gun, keeping the signal station in sight.

Lamehuapi Cove, 5 miles northward of the River Bueno, is well sheltered from the South, but quite exposed to westerly winds, which blow fiercely. It is spacious, has an uniform depth, with good anchorage for many vessels in 6 to 9 fathoms, black sand, and can be made out by a conspicuous wooden building, with a stream to the eastward of it, above the beach. *Hueicolla Cove*, 6 miles S.S.E. of Galera Point, is of moderate depth, varying between 6 and 7 fathoms, sand, but of little importance, being exposed to westerly winds. The point, however, offers some shelter from southerly winds.

PUNTA DE LA GALERA, called by the natives *Buchuchen*, is the most prominent point of the coast of Valdivia; it is low, wooded, slightly undulating, covered with a thick rank vegetation, and has rocky projections extending about 1 cable from the shore. The lighthouse stands on the most projecting extremity on its South side. The point is backed by the remarkable heights called Valdivia Hills, three in number, very conspicuous, pointed at their summits, and 1,550 ft. in height. About 3 miles N.N.E. from Galera Point is Falsa Point, a low projection, with rocks extending nearly a mile off it, but above water; it is in a line with the ridge of Valdivia Hills, which are excellent marks for this part of the coast.

The LIGHTHOUSE on Galera Point is a white tower, 62 ft. high, from which is shown a *fixed bright* light, with a *flash* every minute, elevated 180 ft. above high water, and visible 20 miles.

Between Galera Point and Cape Falsa the land recedes, forming a bay about 4 cables deep. *Huadie Creek*, situated on the South side of this bay, is the only accessible part, having in it depths of 7 to 2½ fathoms, the latter being close to the shore. At the foot of the hills are remarkable white sandy beaches, where landing may be easily effected in ordinary weather. A road leads from hence to the lighthouse, and another to Port Corral. The best

anchorage for small craft is in 2½ fathoms, sandy bottom, near the southern white beach, in the S.W. part of the creek. Large vessels should anchor in 13 to 18 fathoms, outside a line joining Galera Point and Cape Falsa. Firewood and good water can be obtained in the creek.

Chaihuin Gap, said to resemble the entrance to Valdivia, is between Cape Falsa and Chaihuin Point, and immediately South of Chaihuin Point is the river bearing the same name, up which small boats can go for 15 miles with the flowing tide.

VALDIVIA.—From Falsa Point the shore trends N.E. by N. 13 miles to *Gonzales Head*, a woody, bluff, yellowish cliff, immediately behind which is the port of Valdivia. At 2½ miles N.E. by E. of Gonzales Head, is *Punta del Molino*, or Mill Point, off which some rocks lie about 2 or 3 cables' lengths. Mill Point is rather steep, and covered with wood; between these is the entrance to Valdivia, a port apparently spacious and secure, but the portion affording sheltered anchorage for large ships is somewhat confined.

On the second point from Gonzales Head stands a battery, *Fort San Carlos*, the rocks off which may be passed close; on the opposite shore, nearly E.S.E. of San Carlos, is *Niebla Castle*, off which there is 3 fathoms at 2 cables' lengths, and 5 fathoms at 3 cables. In mid-channel there is about 7 fathoms at low water, from which the depth gradually increases seaward.

Light.—A square tower, 24 ft. high, painted white, stands on the western extremity of Niebla Point, from which a *fixed bright* light is exhibited at 121 ft. above high water, and visible 8 miles. A *Semaphore* stands upon the highest part of Niebla promontory.

Amargos Point, which is rather less than a mile from Niebla Point, is low, and has a small battery on it, close to which there is deep water. At about 3 cables' lengths South of Amargos Point, and half a cable off shore, is *Atreal Rock*, awash, which should be carefully avoided; it is now marked by a perch surmounted by a cylinder, painted red. About a mile to the southward of Amargos Point, at the further side of a well sheltered cove, *Calvary Cove*, 3 or 4 cables square, is Corral Fort. In this cove is Port Corral.

In a line from Corral Fort to *Piojo Point*, and midway between them, is a sand-bank that increases gradually, named *Manzera* or *Tres Hermanas Bank*;* it is dangerous to a stranger, there being but little to indicate its situation in the appearance of the water, which is usually discoloured during the ebb tide by that brought down the river. A *buoy* has been placed on its western edge. A staff surmounted by a cylinder and vane, 8 ft. above high water, and painted white, has been placed upon the S.W. extremity of the bank; from it the lighthouse on Niebla Point bears N. 24° E., and Amargos Point N. 31° W.

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* The excellent plan drawn up by Don Jose Moraleda in 1788 does not show this shoal, but gives a depth of 20 or 30 ft. over the space. In other respects the plan seems to be as minute in its detail as the later survey.

Vessels in light winds should be careful of approaching too close to these marks, as the tide sets across the shoal and runs strong at times. The shoalest part is near the S.W. edge, with from 1 to 3 ft. at low water.

Port Corral.—About 4 cables S.S.E. from Cape Calvary is Corral Fort; between these is the port of Corral, one of the largest ports of the Republic of Chile, and of considerable importance, due to the progress of the province of Valdivia by European emigration. Mail steam-vessels call at Port Corral four times a month. It affords anchorage for 25 to 30 vessels, which should, however, moor North and South, as the currents run strong. A good berth for a large ship, as used by H.M.S. *Topaze* in February, 1869, is in 6 fathoms, with Amargos Point bearing N.W. by N. ½ N., and the North point of Manzera Island E. by N. A heavy sea is said to set in during a norther, otherwise the port is very snug, and is believed to be safe at all seasons. The merchant shipping lie with their sterns hauled close in, thus giving plenty of room in what would otherwise be a limited space.

Light.—At 55 yards westward of the Harbour Master's office at Port Corral, and S.S.W. from Niebla Point lighthouse, a *fixed red* light is shown, elevated 108 ft. above high water.

Fresh and dry provisions can be obtained at moderate prices. *Water* is excellent and abundant in the West part of the harbour, also timber for ship-building; but coal for steam-vessels is scarce, and in limited quantities. Water is too plentiful, the climate being almost as rainy as that of Chiloe. The articles exported from Corral consist of all kinds of timber, hides, hops, lemons, charqui, fat, salted meat, and many other products of the industrious German colony on the banks of the Llanquihue Lake. But articles for use in case of vessels requiring repair are scarce.

From an island 300 ft. high, called *Manzera*, to the south-eastward of the bank, there are three river-like inlets, extending southward, south-eastward, and to the north-eastward; the latter is a river, but winding and full of banks, navigable only for small vessels, assisted by a local pilot. About 9 miles up this river, on the South bank, is the town of Valdivia.

The river which enters the harbour from the S.E. is the *Tenguelen;* that from the N.E. which passes the town of Valdivia, and bears its name in the lower part of its course, is called the *Calle-Calle* above. It issues from the Lakes Huanehue, Riñihue, &c., lying in the Llanos or plains West of the Andes, a portion of the chain of which Lake Llanquihue, before mentioned, forms a part. In its upper course it is important to vessels in bringing down the produce of the forests, and it also carries with it the trunks of decaying trees and other matter, which, lodging on the Manzera and other shoals, occasion the decrease in depth in those places to the deterioration of the harbour.

Valdivia was founded by Don Pedro de Baldivia, or Valdivia, in 1551. Eight years afterwards the Araucanians defeated the Spanish troops, and destroyed the town. In 1643, it was taken by the Dutch, who were soon com-

pelled to abandon it. The fortresses erected by the Dutch, afterwards strengthened by the Spaniards, appear at the present day as if of importance, but are in reality almost in ruins. It is 9 miles up the river from the entrance, and has no architectural pretensions. Its population only amounts to about 4,000.

Tides.—It is high water, on full and change, at Port Valdivia at $10^h\ 35^m$; springs rise 5 ft. The currents at the entrance of Valdivia Bay and adjacent coast are somewhat irregular, depending upon the season, tides, and prevailing winds. The flowing tide generally runs at the rate of 1 mile an hour in mid-channel, increasing off Niebla Point and Peña del Conde to 2 miles per hour. During the rainy season, with westerly winds, the flood-tide is scarcely perceptible, but the force of the ebb-tide, increased by the falling rivers, obtains a velocity of 3 to 4 miles, increasing near Gonzales Head to 5 and 6 miles an hour, which gradually decreases in its course southward, but passing round Galera Point still with perceptible force.

Bonifacio Head, about 8 miles North of Gonzales Head, is bold, and has deep water near, there being 20 fathoms at 2 miles off it. Between Molino Point and Bonifacio Head are two landing places, one of them near a mission station. From Bonifacio the coast trends to the northward, about 19 miles to *Chanchan Cove*, at the mouth of the River Mehuin, a tolerably good anchorage for coasters in summer only.

At *Cocale Head*, 8 miles North of Chanchan Point, the coast changes its character, becoming low and sandy, with occasional cliffs; the high lands, which to the southward of this point bordered the ocean, here retreat 5 or 6 miles, leaving a level and apparently fertile country, as far as abreast of Mocha Island. This piece of coast lies N.W. by N., and extends nearly 60 miles. Off its whole extent there are comparatively shoal soundings, 10 fathoms at 2 miles distance, 20 fathoms at 4 miles, everywhere a sandy bottom; it is therefore dangerous to approach at night without the lead going; and a heavy surf breaks everywhere, even in fine weather.

Menguin or *Mehuin River*, emptying itself by a shallow mouth into the sea in Chanchan Cove, is navigable for about 15 miles with small boats. *Queule River*, 6 miles to the northward of Chanchan Cove, enters the sea immediately to the northward of Ronca Point, which shelters it from the S.W. swell; there is only 1 foot on the bar at low water. Queule Bay offers an excellent anchorage East of this point, over a bottom of sand; except during westerly and northerly winds. It is much frequented by steam and sailing vessels, particularly during winter, the latter anchoring farther out in the bay.

Tolten River, 8 miles northward of Queule River, is scarcely discernible 2 miles off shore. The depth of water over the bar is 10 ft., and maintains this depth for about half a mile, gradually increasing to 25 ft. farther up the river. The current with the ebb runs at the rate of 5 miles an hour near the mouth, which is only a little over 100 yards wide. The navigation of the river with

boats is at times laborious, owing to the strong currents which are met with at every turn. The banks of the river are well wooded with fruit trees, timber for shipbuilding, &c., &c. The town of Tolten lies about 2 miles above the bar.

Rio Imperial* or Cauten is 27 miles N.W. by N. of Tolten River. The bank forming its bar crosses the mouth from North to South, leaving a channel S.W. of Mount Cholgui, and another West of it, about 170 yards distant from each other. The depth of the first is 18 ft. at high water, and 170 yards wide; that of the second is 12 ft., and about 110 yards wide. The S.W. channel has at present the best entrance.

In entering the Rio Imperial vessels should keep near the southern shore to avoid the sudden change in its course, and have an anchor ready in case of need. In going up, keep in the middle when about a mile from the lagoon, and steer straight for the hill at the angle where it joins the river. At the base of this hill is excellent anchorage sheltered from the North.

The mouth of the Rio Imperial is now perfectly practicable for sailing and steam vessels, drawing not more than 12 ft. water. During rainy seasons it is navigable for vessels of greater draught. The river is navigable for the same sized vessels for about 18 miles from its mouth. As the influence of the tide reaches to about 21 miles from its mouth, smaller vessels should be able to go much farther; however, the upper part of the river has not been explored.

Ranges of cliffs extend for several miles at a time along the shore between the rivers Tolten and Cauten, and on their level summits, in former years, might be seen troops of the unconquered Araucanian Indians riding lance in hand, watching the passing ships. The summits of the Andes are visible for a great distance, northward and southward, whenever the weather is clear.

Cauten Head.—At 9 miles N.W. ½ N. of the Imperial stands *Cauten Head*, in latitude 38° 40′ S., a bold, cliffy headland, about 300 ft. in height, and apparently steep-to. From thence cliffs, more or less broken, extend 10 miles to Manoel Point, 20 miles East of Mocha Island; at 8 miles N.N.W. from Manoel Point is Cape Tirua, the point of the main land nearest to Mocha.

Cape Tirua has a small islet close to it, and in a little bay just to the northward is the mouth of the River Tirua, whence a communication used to be kept up by the Indians of the main land with those who lived on Mocha Island, by means of rafts (Balsas) and large canoes. The channel between Mocha and the

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* The city of Imperial was founded by Valdivia in 1550, and stood on the Cauten River. It has been obliterated by the successful Araucanians, and near its site now dwell the remarkable Boron tribe.—*FitzRoy*, p. 402. In 1866-7 the Chilian Government took possession of a large portion of the Araucanian territory, and had advanced their frontier to Angol, about 36 miles South of the Bio Bio River. This gave a great impetus to the expansion of wheat cultivation, and brought about an extensive exportation of grain to England and Australia. With the place above mentioned, the Chilian troops took possession of all the ports and landing places between Lota and Valdivia.

main land is perfectly free from danger, the depth varying regularly from 10 to 20 fathoms, over a sandy bottom. The tide runs about a knot during springs; the flood sets to the northward.

MOCHA ISLAND, a prominent landmark for navigators, is a lofty, hilly island, about 7 miles long and 3 miles broad, its summit 1,250 ft. above the sea. Its South extreme is abrupt, but the North end descends gradually into a long, low point. In clear weather it may be seen at 30, 40, or even 50 miles distance; but no soundings are any guide in its neighbourhood. They are irregular, and indeed not to be got, except very near the land. It should not be approached too closely, however, on its North, West, or South sides, as dangerous rocks lie off it, those from the South end extending 3 miles out. The steamer *Illimani* was totally wrecked on July 18th, 1879, on a reef said to lie about 2¾ miles S.S.E. from the South point of the island. During the flood tide these rocks are particularly dangerous, as it sets towards them from the south-westward. Sometimes the ebb stream is scarcely felt for days together, and then the flood stream has the effect and appearance of a continual northerly current.

Previous to the 18th century Mocha was inhabited by the Araucanian Indians, but they were driven away by the Spaniards. There are now several cottages on it, whose occupiers engage themselves in rearing cattle. The anchorages are indifferent, one on the N.E., the other near the S.E. point, called by the Spaniards *Anegadiza*. The anchorage near Anegadiza is good in northers, in front of the first little hills, in 6 or 7 fathoms, sand; the other, off *English Creek*, in 13 to 20 fathoms, over a sandy bottom, nearer the shore is rocky. The landing is bad, and there are now few supplies to be obtained except wood, and with considerable difficulty water, but of excellent quality. Were there any adequate object in view, a good landing place might easily be made, and there is abundant space on the island for growing vegetable produce, as well as pasturing animals.

Hasslar Bank, in lat. 37° 52′ S., long. 74° 10′ W., of 13 fathoms, was discovered by the U.S.S. *Hasslar* in 1872. The position is N.W. ¾ N., 30 miles from Mocha Island.

From *Cape Tirua* to *Tucapel Point* is a wild, exposed coast, totally unfit to be approached; it is incessantly lashed by the S.W. swell, and has no kind of shelter, with the exception of *Port Quidico*, or *Nena*, 10 miles to the northward of Cape Tirua, sheltered from south-westerly winds by Nena Point and a rocky bank extending more than three-quarters of a mile N.N.W. of it. The anchorage for steam vessels is East of Nena Point, in 6 fathoms, sand and shells; but sailing vessels should anchor farther to the northward, and be prepared to weigh when the wind veers to the North.

An easterly current of a mile an hour or more prevails between Chiloe Island and Lota Point; its direction appears to vary between N.E. and S.E., according as the wind is northerly or southerly, but it is always towards the land. Several vessels have been placed in dangerous vicinity to the shore by its effects.

In June, 1868, H.M.S. *Nassau* unexpectedly made Tucapel Point with a strong E.S.E. current, the wind at the time being from N.W.

Morguilla Point.—At the N.W. end of a long low beach, on which there is always a heavy surf, is Morguilla Point, on which H.M.S. *Challenger* was wrecked in 1835. At 13 miles N. by W. ½ W. of Morguilla Point is *Point Tucapel*, a projecting rocky point, 624 ft. high, flat-topped, and dark coloured. The interior country hereabouts is very fertile and beautiful. Hill and dale, woodland and pasture, are everywhere interspersed, while numerous streams plentifully irrigate the soil.

Lebu Cove.—Between Tucapel Point and Millongue Point, a rocky projecting point, 2 miles farther North, there is a cove, into which the *River Lebu* runs. Vessels may find shelter there if the wind does not blow strong from N.W., but it has no defence from that quarter. Boats can enter the river at half-tide, when there is not much swell on the bar. In former days there was a settlement called Tucapel Viejo at the mouth of this river. Some coal mines were opened here in 1866, by Mr. Jno. Mackay, and in 1876 coal was exported the amount of 72,000 tons. It is loaded by means of lighters, but it has been proposed to construct a harbour to facilitate traffic. In 1877, 278 vessels entered here, with a total tonnage of 146,648. Provisions are good and abundant; water is supplied alongside in launches at 2 dollars per ton. The town has about 6,000 inhabitants, and is connected with the *telegraphic* system.

Maule Shoal, lying about 8 miles N.N.W. from Millongue Point, and 3 miles West of Lacobe Point, is a sunken danger, which appears to extend towards Lacobe Point, but there is sufficient water to pass between it and the shore. Millongue Point is the South extreme of Carnero Bay.

Carnero Bay is a wild, exposed bight, unfit for shipping, but *Yanez Cove*, at its northern end, affords anchorage for coasting vessels of small size. *Carnero Head* is a cliffy bluff. From thence to *Cape Rumena* and *Lavapie Point* the shore is bold and cliffy, and backed by high land, well wooded. Cape Rumena was recommended by Capt. Beechey as a landfall in going to Concepcion.

Piures Cove lies 9 miles to the northward of Carnero Head, and here vessels of small draught find excellent shelter, but they should not attempt entering there without a pilot. At 2 miles South of Cape Rumena, and 1½ mile off shore, is a shoal or rock, which appears at low water springs.

SANTA MARIA ISLAND is comparatively low and dangerous, on account of numerous outlying rocks. It has a cliffy coast, and somewhat irregular currents around it.

Caution.—Several rocks have been at different times announced as lying at the distance of from 1 to 2 miles from Cape Rumena, and also as existing between Lavapie Point and the South point of Santa Maria Island. *Hall*, or *Strachan Rock*, said to lie N.W. of Cape Rumena, and about 3 miles off shore,

was not found by the *Shearwater*, the only danger discovered being a rocky 4-fathoms patch, with Cape Rumena bearing South, and Lavapie Point N.E. ½ N., about 1½ mile from the cape, and two-thirds of a mile off shore. But many commanders have said that it exists farther off shore, and it has been seen to break. *Meteor Rock*, of 13 ft., is reported in a Chilian government notice as lying 1 mile South of the South point of Sta. Maria Island. A rocky patch of 2¾ fathoms lies half a mile N. by W. from the East rocky point of Luco Bay, and a rock awash 6 cables N.W. from Lavapie Point. *Cockatrice Rock* lies 3 miles W.S.W. from the South end of Santa Maria Island.

In consequence of the foregoing reports, it is recommended to observe great caution in using the channel between Lavapie Point and Santa Maria Island; also vessels bound to or from Arauco Bay are cautioned not to approach the shore between Carnero Bay and Lavapie Point within 4 miles, not only in order to pass outside the reported dangers, but to avoid the foul ground and kelp which extends a considerable distance off the land. An *easterly current* may generally be expected in the above localities, which at times has been experienced running with a velocity of from 1 to 2 miles an hour.

Off the S.E. side of Santa Maria Island there is a tolerable roadstead, with from 4 to 8 fathoms water, over good ground; but the only place now sheltered is quite close to the South point of the above island. Formerly there was good anchorage between this point and Delicada Point, but the earthquake of 1835 raised the bottom nearly 1½ fathom; so that where there was a depth of 5 fathoms in 1834, the *Beagle* found only 3½ fathoms in 1835.

In passing round Santa Maria, to the eastward, a wide berth must be given to the shoal which now runs off towards the S.E.; it is not prudent to go a cable's length to the northward of a line drawn E. by N. ½ N. from the southern point of the island, until 3 miles eastward of that point, where there is but 4 fathoms at low water. From thence the shoal turns to the northward round *Delicada Point*, off which the water deepens to 10 and 20 fathoms: there is anchorage on the N.E. side of the island during southerly winds. Water is good and abundant; there is also plenty of wood and vegetables, but little else at present.

Off the N.W. end of the island are many rocks, one of which, the *Dormido*, lies 3 miles off to N.W. ½ W., and the *Vogelborg* 4 miles to N. by W. ½ W.*

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* *John Renwick Rock.*—The *John Renwick* was wrecked on a rock off Santa Maria, in the night of July 4, 1848, stated to be in lat. 37° S., long. 74° 44′ 30″ W., bearing N.W., 12 miles from Point Lavapie, and W.S.W., 6 miles from the North end of Santa Maria Island. Those well acquainted with the locality disbelieve the statement, and consider that it was Dormido Rocks on which the wreck took place. Madame Ida Pfeiffer in her work also mentions the commander in terms which would confirm the disbelief. It is necessary to mention it here.

They are sometimes undistinguishable by breakers; and it is not safe to pass between them and the island, neither is it prudent to approach the western side of Santa Maria nearer than 3 miles.

There is tolerably good anchorage in 5 fathoms in *Luco* or *Llico Bay*, to the eastward of Cape Lavapie, but not quite sheltered from N.N.W., and liable to heavy squalls off the heights over Cape Rumena when it blows strong from the south-westward. Good coal is found here and brought to the loading place by railway. Provisions and water are abundant; the inhabitants number about 200.

ARAUCO BAY lies inside Santa Maria Island, and is about 15 miles broad and 18 miles deep. It has good anchorage throughout in southerly winds, but is entirely open to the North, except in Luco Bay.

For 3 or 4 miles on each side of the River Tubul the coast is steep and cliffy, with high down-like hills. *Tubul River* was formerly capable of receiving vessels of considerable burthen—vessels of 200 tons could pass up nearly a mile; but the earthquake of 1835 raised its bar so much as to prevent access to more than boats; but that the bar will remain is unlikely. The neighbouring country is very beautiful and fertile.*

Off the N.W. point of the long cliff West of Tubul River, and 1 mile from the land, is a rock called *El Frayle*, on which the sea always breaks, unless the water is unusually still.

Laraquete Beach extends 10 miles to the N.E. from Tubul Cliffs; and 2 miles off it there is from 8 to 10 fathoms water, over a sandy bottom. The *River Carampangue* is not navigable at its mouth, though deep and rather wide 2 miles inland; its exit is choked by sandbanks.

Arauco, famous in Spanish song and history, is now simply a small collection of huts, covering a space of about 2 acres, and scarcely defended from an enemy by a low wall or mound of earth. It stands upon a flat piece of ground, at the foot of the Colocao heights, a range of steep, though low hills, rising about 600 ft. above the sea. In the sixteenth century, Arauco was surrounded by a fosse, a strong palisade, and a substantial wall, the work of the Spaniards. This was the first place assaulted by the Indians, after their grand union against the Spaniards, at the end of the sixteenth century. It was surrounded by the hostile Indians, who at first unsuccessfully attacked the fortress; but the Spaniards, seeing that they must be overpowered, escaped in the dead of the night. Thus began the famed insurrection which caused the destruction of seven towns, and drove every Spaniard from Araucania.

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* In the river, Admiral FitzRoy saw the remains of the *Hersilia* whaler, captured by the pirate Benavides. He was a most remarkable character, a native of Concepcion, taken prisoner at the battle of Maypu, 1818, and for his crimes sentenced to be shot; but, though terribly wounded, had the fortitude to feign death, and escaped. He then entered the Chilian army, and afterwards became pirate. The particulars of this singular man are given by Capt. Basil Hall, in his Extracts from a Journal, &c., vol. i., chap. 22.

From the River Laraquete to *Coronel Point*, the coast runs N. by W. ½ W., 11 miles, high and bold, free from outlying dangers, and affording temporary anchorage for small vessels, or at the least shelter for boats, in three or four coves; and at the mouth of the little *River Chivilingo* affords shelter for small craft, excepting during S.W. gales. *Fuerto Viejo Cove*, immediately South of Colcura, is equally exposed to the S.W. and N.W.

LOTA, a little cove just to the northward of Colcura, is the best of the three, but it also is open to the S.W. This port has become of much importance in consequence of its considerable export of coal and copper; for smelting the latter, there are some very extensive works. It may be known by two long white houses on the hill above the cove, and a long iron jetty, with a wheel and drop on the outer end of it for coaling purposes, alongside which two vessels, of 20 ft. draught, can load. Fresh meat and vegetables are to be obtained at a moderate price. Lota was established in a single year, and has all the necessary machinery for working the coal mines. A number of Scotch settlers were at first established here, and have served to increase the development of the important resources of this coal district; its population now amounts to about 5,500. Mooring buoys are laid down,

Light.—An iron lighthouse is being erected on Lota or Lutrin Point, on the North side of the entrance to Lota Bay, and it is expected that the light will shortly be exhibited.

Coals.—Good steaming coals can be obtained here at 5 dollars per ton; it is, however, quick consuming fuel; 250 tons can be put on board from the drop in one day, under which there is 20 ft. water at low water spring tides. In 1876 about 84,000 tons were exported, and great quantities of copper have been annually exported. The coal mine is only a few fathoms from the jetty. Good fire bricks are also to be got at Lota, and vessels can have repairs executed here. In 1875, 442 merchant vessels, with a total tonnage of 275,810, entered the port. The *telegraph* system is extended to Lota.

At Colcura the veins crop out quite close to the sea, beneath which they dip within a very short distance, a fact that has had great influence in their prosecution.

CORONEL BAY, at the north-eastern part of Arauco Bay, and about 3 miles to the northward of Lota Bay, is a place of export for coal. The town is a small place, situated about 1 mile eastward of the Pachuco wharves.

There are two piers at Coronel with tramways and waggons; the mines belong to the Pachuco Company, and, if need be, 800 tons of coal can be furnished alongside any ship in the bay in the space of 12 hours. The P.M.S. Company's steamers take all their coal from Coronel; it is also frequented by H.M. ships for that purpose, and it is not uncommon to see eighty or ninety colliers at anchor off Pachuco, besides steam vessels, taking in coals. In 1872 the cost of coals at Coronel was about half that at Tomé. H.M.S. *Chanticleer*,

in 1871, used coal from the Pachuco mine, Coronel, and found the steaming qualities good, equal to second-class Welsh coal, with a little brown smoke, and to burn clearly without choking the tubes, although it burnt quickly, at the ratio of 12 to 10 of Welsh coal.

A secure berth will be found in 9 fathoms, with Pachuco Point, the N.W. extreme of the bay, bearing West; Lota Bay Point, which separates Lota Bay from Coronel Bay, S. ¾ E.; Coronel Town, N.E. ¼ E. At this place a strong sea breeze raises a swell which prevents coal lighters from being brought alongside. Under ordinary circumstances a ship may take in about 20 tons of coal an hour.

Coronel Point may be distinguished by its having a small house on its extreme, and just South of it is the old framework of some mining shaft. These are good marks to know Coronel Point, and when abreast of it, and well outside the breakers, two chimneys will be seen very distinctly on Pachuco Point, with some houses just North of the chimneys and a few trees; also shipping standing in or out of the bay, and others at anchor in the offing, indicate your near approach to Coronel Bay. After passing Pachuco Point a ship may be steered for the anchorage off Pachuco Pier, or off the town or village of Coronel.

As the water is reported to shoal some distance farther off than shown on the plan of Coronel and Lota, do not come under 10 fathoms in rounding Pachuco Point.

At 1 mile W.N.W. from the South extreme of Pachuco Point, and half a mile from the shore, with 9 and 10 fathoms between, lies a rock about a quarter of a cable in extent, with 4 fathoms water.—*Noticias Hidrograficas*, 1878.

Vessels likely to remain any time should anchor well in the bay, off the town pier, where they will be well sheltered from North, N.W., and West winds, and not so much exposed to the heavy rolling swell that sets in when blowing hard outside.

Vessels only remaining at Coronel to coal for a few hours can anchor off the Pachuco new pier in 9 fathoms, with the pier N.W. ½ N., and Pachuco Point W. ½ S. At this anchorage coaling can be carried on with great rapidity. The Pacific Steam Navigation Company have placed buoys close in for their ships, to facilitate their coaling, and obviate their being obliged to anchor, as they remain so short a time. Great attention is required to the lead in standing into this anchorage, for the deep water runs close up to the 5-fathoms line. Landing on the beach is attended with some danger at times, as the sea breaks with violence on it, and should not be attempted, as there are good landing steps at the pier.

Bio Bio River.—The entrance of the great River Bio Bio is not accessible, on account of its sand-banks, and the S.W. swell. Its situation, together with that of San Vicente and Concepcion Bays, is well indicated by the remarkable

pointed hills, about 800 ft. high, called the Paps of Bio Bio, 11 miles N. by W. ½ W. from Coronel Point. There is no danger near them except rocks close to the shore. The *town of Concepcion* is 7½ miles from the mouth of the Bio Bio, and contains about 20,000 inhabitants. *San Vicente Bay* is an exposed bad anchorage, with two rocks above water on its South side. In the N.E. part of the bay is Marullo Bank, of 3 ft. water, half a mile off shore, and 2 cables W. by S. of this bank is the small Villa de Burdeos Rock, having 13 ft. over it at low water.

Tumbes Peninsula.—Close off the *Heights of Tumbes*, the western promontory of the fine bay of Concepcion, there are a few straggling rocks, some under, some above water, near Lobo Point, Pan de Azucar, and Tumbes Point; this piece of coast trends North 6 miles from San Vicente Bay. At 1¼ mile N.W. of Tumbes Point there is a rock above water, called *Quebra Olla*, or Break-pot Rock, between which and the point it is not prudent to pass.

CONCEPCION BAY.—Between Tumbes Point and Loberia Head, 6¼ miles to the N.E. ½ E., lies the entrance to the bay of Concepcion, the finest port on this coast, being about 6 miles deep and 4 miles wide, having anchorage ground everywhere, and abundant space, well sheltered.

LIGHTHOUSE.—*Quiriquina Island*, lying North and South, 3 miles long by nearly 1 mile wide, gives shelter from northerly winds; and near Arena Point, at its S.E. extreme, is a good place for ships to anchor temporarily. A circular white lighthouse, 36 ft. high, stands on the northern point of Quiriquina Island, and shows, at an elevation of 213 ft. above the sea, a *bright* light, *revolving* every half minute, and visible 15 miles.

Loberia Head may be distinguished even on a dark night, being a high, dark bluff, with several rocks lying off it, against which the sea breaks with great fury during a north-westerly gale; as also along the coast northward to Parra Point. These breakers, with those on Pajaros Niños Rocks, off the North point of Quiriquina, are generally luminous at night, and, combined with the roar, will warn the seaman of his approach.

A stranger making the light on Quiriquina Island at any time may enter Concepcion Bay and get secure anchorage, bearing in mind the lighthouse is a quarter of a mile inside Pajaros Niños Rock. This can be done by running down with the light S. by E. until Loberia Head bears E. by N. ½ N., when the course can be altered to S.E. until soundings are obtained in from 17 to 19 fathoms, or the light on Quiriquina Island bears W.N.W.; should the wind be from the N.W., a ship may be hauled to the south-westward, and anchor anywhere under Quiriquina Island, taking care at night not to approach it too closely.

Ships bound to Concepcion Bay from the southward and westward, in thick weather, should not reduce the soundings under 45 fathoms, nor approach Quiriquina light at night until it bears southward of East; Loberia Head may then be steered for, and the bay entered by Great Channel, as before directed.

There is a passage into Concepcion Bay on either side of Quiriquina Island, but the best for those not locally acquainted is to the eastward of the island, the only dangers in this channel being the steep and dangerous *Concepcion* or *Lozzi Rock*, of 19 ft., W.S.W., half a mile from Loberia Head, and *Zealous Rock*, about 2 miles to the southward, also on the eastern side of the channel, and S. by W. 4 cables from Huily Head. The latter was to be marked by a buoy. *Rundle Rock*, of 4 ft., lies 5 miles to the southward, 3 cables S.W. of Parra Point, to which it is joined by a shoal bank.

Coal is found and worked abundantly about Concepcion. It is of the same quality as noticed on a preceding page. Some mines are at Talcahuano, where the coal crops out on the N.W. side of a hill near the shore of the bay. It has two veins, each 3 ft. thick, separated by a sandstone stratum 5 yards thick. The coal is very bituminous, and burns with the odour which characterises the lignites. The next mines are those of Dr. Mackay at Tierras Colorados, on the River Andalien or Aldarien. These have produced the best coal, and lie conveniently. Two other veins on the East side of the bay have not been productive. One was near Point Lirquen, close by Old Penco, and another is in Coliumo Bay.

PORT TALCAHUANO is at the S.W. angle of Concepcion Bay, and vessels can anchor off the pier in 4 to 5 fathoms, good holding ground. Until lately this was the only port in the bay, but *Penco* and *Tomé*, in the S.E. and N.E. parts of the bay, are fast rising into importance; the former was the ancient port of Concepcion. The town, which has 2,200 inhabitants, is well built, and has a wooden jetty extending into the bay, but it has been proposed to execute some extensive harbour works here, including a dry dock. The *railway*, 108 miles long, connecting the mines near Chillan with this part of the coast, will much increase the importance of these ports. There is a *telegraph* station here. In 1879 the value of the exports amounted to 4,658,959 dollars.

Near the anchorage off Talcahuano are the Belen, Marinao, and Manzano Banks, but their positions are clearly shown on the chart. On the North part of Belen Bank, of 9 ft., there is generally a *black buoy*, carrying a *red ball*, with the outer end of the principal mole bearing S.W. by S. $\frac{1}{4}$ S., Fronton Point N. $\frac{1}{2}$ W., and the tower of Tomé Church N.E. by N. Should the buoy be gone, keep Mount Espinosa well open of Talcahuano Head, until the highest hill (to the right of the town) on the southern part of the heights of Tumbes bears W.S.W. or S.W. by W. $\frac{1}{2}$ W.

Marinao Rock is awash at low water, and has on it an iron rod, surmounted by a ball, painted black. *Manzano Rock* lies about $3\frac{1}{2}$ cables N. by W. of Marinao Rock, and from an examination made by H.M.S. *Alert*, 1880, it is found to be identical with the *Choros Bank* of former charts. *La Viuda Rock*, three-quarters of a cable North of Talcahuano custom-house, is awash at low water, and marked by a pole 15 ft. high, painted white, which is useful as a guide for making the mole.

About 1½ mile W.S.W. from Lirquen Point, at the S.E. part of the bay, Capt. Beechey found a rock, or rocky shoal, with only 15 ft. on it. The *Beagle's* boats searched for it in every direction near the place indicated by him, but could not succeed in finding less water than 9 fathoms. Nevertheless, such authority as that of Capt. Beechey is not to be doubted, and ships should avoid that part of the bay, till the exact situation of this danger is decided; it is not at all necessary to stand over so far towards the East shore when working up to Talcahuano. H.M.S. *Alert*, 1880, made a careful search for this rock, but could not find it.

Supplies.—The country around amply rewards cultivation. Some of the valleys at the back of the town of Concepcion are very fertile, producing grain of all kinds in abundance. Beef and mutton are cheap and good, the former about twopence per pound, the latter 1 dollar the carcase; pork and fowls rather dearer. Vegetables of all kinds cheap and plentiful, as well as fruits in their season; wood plentiful, at two dollars per 1,000 billets. Good water can be procured from a tank which carries 30 tons, at 2 dollars per ton.

Earthquakes are very common in this region, and must considerably affect the general prosperity of the country. We have before alluded to the awful earthquake of February 20th, 1835. Its effects were particularly ruinous to Concepcion. About half an hour after the shock—the sea having retired so much that vessels which had been lying in 7 fathoms water were aground, and every rock and shoal in the bay were visible—an enormous wave was seen forcing its way through the western passage, which separates Quiriquina Island from the main land. This terrific swell swept the steep shores of everything moveable within 30 ft. (vertically) from high-water mark, and then rushed back again in a torrent, which carried everything within its reach out to sea, leaving the vessels again aground. A second wave, and then a third, apparently larger than either of the two former, completed the ruin. Earth and water trembled; and exhaustion appeared to follow these mighty efforts.

This earthquake was felt at all places between Chiloe and Copiapo, between Juan Fernandez and Mendoza, an area of 700 by 400 miles; and Mr. Darwin says, we can scarcely avoid the conclusion, however fearful it may be, that a vast lake of melted matter of an area nearly doubling in extent that of the Black Sea, is spread out beneath a mere crust of solid land. One of the permanent effects of the earthquake has been to raise the level of the land. It has been shown that the Island of Santa Maria, off Arauco Bay, was raised 9 ft.; and it is almost certain that there has been an uplifting of the bottom of Concepcion Bay, to the amount of 4 fathoms, since the famous convulsion of 1751. Other notices on this subject will be found elsewhere.

Tome' Bay is at the N.E. part of Concepcion Bay, Huily Head, the northern limit of the bay bearing from Loberia Head S.E. ½ E., distant 2⅓ miles. The bay is about 1½ mile across, half a mile deep, and affords good and safe anchorage in from 8 to 12 fathoms.

Should it be required to anchor at Tomé, bring the conspicuous white church spire (the only one in Tomé) in line with the end of the pier, and keep them on until the extreme of the land of Huily Head comes in line with the extremity of Loberia Head; with these marks the best anchorage can be obtained for a large ship in 10½ fathoms, mud, good holding ground. Great care is required in anchoring here, as the water shoals very suddenly.

These remarks apply to daylight, as it is presumed that no stranger would take up a berth at Tomé at night, without the aid of the moon, and the weather fine. At the commencement of a N.W. gale a second anchor should be let go, as Huily Head affords little protection.

This thriving seaport has a nice appearance from the anchorage; the town covers a large extent of ground, and has a good hospital. There is also a good pier, 150 ft. long, with two cranes at its end, capable of lifting two tons each. There appears to be a good trade here. The chief export is grain. In 1875 the total value of exports from Tomé was £288,555.

COLIUMO BAY.—The highest land in the vicinity of Concepcion Bay is *Mount Neuke*, 1,790 ft. in height, 5 miles eastward of Loberia Head. At 4 miles to the northward of this head, at Cullen Point, the coast again trends short round East and then South, so as to form the small *Bay of Coliumo*, where coasters may anchor in security, but there is not much shelter for large ships during northerly winds. It has always been the scene of smuggling transactions. The best anchorage is close under the height over Coliumo Head, where *Rare Cove* offers good landing for boats, and a convenient watering place.

From Coliumo Bay, 16 miles North to *Boquita Point*, and thence 40 miles farther, in a similar direction, to Carranza Point, the coast assumes an unbroken line, without any place for shipping. It is a deep-water shore; the land rises to a considerable height, and is partially wooded.

Fox Bay is the name of the open exposed bight, South of Cape Carranza, and at the southern part of it, at about 10 miles from the cape, is the open roadstead of *Curanipe*, where ships occasionally remain, and where there are moorings laid down in from 6 to 12 fathoms. In February, 1872, the English ship *Bogota* was wrecked at Curanipe.

Carranza Point.—Among the rocks at Cape Carranza boats find shelter occasionally. It is a projecting and rather low part of the coast, and therefore to be avoided; for about 10 miles on each side of the point there is a sandy or shingle beach. A shoal with 13 ft., on which the sea breaks occasionally, is said to lie about 3½ cables N. by E. from the outermost rocks off Cape Carranza.

Cape Humos.—At 17 miles N. by E. from Cape Carranza is Cape Humos, a remarkable headland projecting westward, and higher than other land near that part of the coast; it is bold-to, and there are no outlying dangers in the vicinity.

RIVER MAULE.—At 4 miles N.N.E. from Cape Humos there is a remarkable rock, called La Iglesia, or the *Church*, from its appearance, 1 mile N.E. of which is the entrance of the River Maule. There is no mistaking the entrance, for on the South side the land is high and the shore rocky; while on the North side a long, low, sandy beach extends beyond eyesight. Not far from Church Rock, a remarkable bare space of gray sand may be seen on the side of a hill, but generally the heights between Cape Humos and the Maule are covered with vegetation, and partly wooded; the highest hills in the vicinity range from 1,000 to 1,300 feet.

The western point of the Maule is the high land called the *Cerro Mutün*, which much resembles the Rock of Gibraltar on a smaller scale. At its North end is the small open cemetery, and off its northern point are two high pyramidal rocks, called *Los Ventanas* (windows), and *Piedra Lobos;* the first from its being pierced through, and the second from being the resort of seals. Just beyond the latter is the bar, formed by the river current and the ocean swell, and which is constantly shifting, and only fit for small vessels, which are frequently detained for some days for smooth water. This difficulty arises from the fact that the prevalent southerly wind is lost on approaching the Piedra Lobos, at the same moment that the river current is encountered, and vessels are thus thrown on the North Spit of the bar.

The annually increasing commerce of the port demands some attention to the increase of its capability; it has been proposed to deepen the channel over the bar by dredging, &c. Steam-vessels ply between it and Valparaiso.

A most productive country surrounds it, abounding with internal and external wealth, and the fine river communicates with the interior, and is navigable far inland; besides which, the best pass through the Andes (discovered in 1805) is not far from the latitude of the Maule, being nearly level, and even fit for waggons, the only pass of such a description between the Isthmus of Darien and Patagonia.

CONSTITUCION, a small town, lies on the West bank of the river, at the base of the Cerro Mutün. At first it was called Nuevo Bilbao, and by the natives usually Maule. It has very considerably increased of late years, and now has a population of about 10,000 inhabitants. Its streets are parallel, and at right angles, with a plaza in the centre. Its public buildings are not very conspicuous. Very few wells are dug, and there is thus a scarcity of water. Ship-building is carried on to a considerable extent, but the chief trade is in sawing and preparing the timber, which is floated or brought from the back country. Its trade is rapidly increasing, large quantities of wheat being shipped from here. The depth on the bar varies, according to the time of year, from 9 ft. to 25 feet.

A ship may anchor, in fine weather, in from 10 to 15 fathoms, sandy ground, from 2 to 3 miles N.W. of Church Rock; there is no hidden danger, but an

extensive sand-bank North of the river shelves out to seaward, and should have a wide berth. Behind this sand, evidently formed by the detritus brought down the river, there is a flat, several miles in extent; this flat, in front of the high ground, and the largest on the West coast of South America, reaches to within 5 miles of a very remarkable valley, called *Falsa Maule*, from its having been taken for the entrance of that river.

El Penon Point lies 12 miles North of the entrance of the River Maule, and is the northern entrance point of the River Mataquito, which a few years since emptied itself 4 miles to the southward of this point. About 3 miles N.N.W. from El Peñon Point is *Lloca Point*, rugged and rocky, with a house in ruins close to it. *Duao Point*, on which the Pacific Steam Navigation Company's steam-vessel *Valdivia* was wrecked, lies about 4 miles to the northward of Lloca Point. From Duao Point, the coast extends in a northerly direction for 8 miles to *Llico Road*, which may be recognized from seaward by the brown sandy heights to the eastward of Llico. The anchorage is in 16 or 18 fathoms, sand and mud, half a mile N.W. by W. from the outlet of Vichuquen Lagoon. Although the anchorage is exposed to all winds from North round by West to South, the holding ground is good, but during a norther, it would be advisable to proceed to sea. Boats of the place will be sent off when the bar is safe, at a charge of 9 dollars. There are few supplies except water at 1½ cent per gallon alongside, and fresh meat, which can only be obtained occasionally; wheat is the principal article of export.

Lora Point, 12 miles N. ½ W. from Llico, is rugged, and has no outlying dangers. Between it and *Lobos Point*, which is moderately high, 8 miles to the northward, is the outlet of *Cahuil Lake*. *Pichilemu Point* is a low, rocky point, 3½ miles N.E. by N. ½ N. from Lobos Point, the coast between being sandy, and approachable only in fine weather. *Topocalma Point*, 18 miles to the northward of Lobos Point, is an inaccessible bluff promontory, 525 ft. high, with a gully on its East side. The North side of the point is rugged, with several rocks near it; on the South side is Peña de Lobos, a high islet close to the shore. There is anchorage in 17 or 20 fathoms, sand and mud, about half a mile North of Topocalma Point, exposed to all winds from North round by West to South.

St. Domingo Point, the summit of which is 334 ft. high, lies N.N.E. 4 miles from Topocalma Point, and is the South point of Tuman Bay, in the South part of which there is anchorage, about half a mile North of St. Domingo Point, in 10 or 12 fathoms, sand, and sheltered from the southerly winds and swell.

Farallon del Infirenillo is an island in the form of a pyramid, lying close to the shore, half a mile North of Barrancas Point, and is easily recognized when nearing Topocalma Point, which is the best point for a vessel to make when bound for Tuman Bay. *Pupuya Island* lies 3 miles N. by E. from Barrancas

Point, and about a quarter of a mile off shore; it is a large steep rock, with a flat top, sloping to the W.S.W.

Metanza Cove, in lat. 33° 59′ S., and about a mile North of Pupuya Island, has several small islands and rocks in its vicinity. The cove may be recognized by a ravine with a small inlet, called Matancilla, on the North side of which is a house, with its North side painted white, and its roof red. The hills North of the ravine are high and green, while those South of it are composed of sand.

About 4 miles north-eastward from this cove is *Natividad Bay*, but it offers no good anchorage, and is much exposed. Rapel Point is on the North side of the bay, close to the River Rapel. At 3 miles N.W. of Rapel Point stands Bucalemo Head.

Bucalemo Head is a bold cliff, 200 ft. high; and 2 miles West of it lies *Rapel Shoal*, sometimes but erroneously called *Topocalma Shoal*. This shoal extends nearly a mile, and has three rocks above water, on which the sea breaks in all weathers, at nearly 2 miles off shore. At 5 miles North from Bucalemo Head is *Toro Point*, close off which are a few rocks; *Coronilla Rock*, with about 4 ft. on it at low water, is reported to lie about 3½ miles N. by W. ½ W. from it; and at 1½ mile N.E. ¾ N. from the point is *Toro Shoal*, nearly half a cable off shore. Another reef, about 4 cables long East and West, and 2¾ cables broad, is said to lie nearly 1½ mile N. ½ E. from the western extremity of Toro Point. The coast trends north-eastward from Toro Point, forming a bay as far as the River Maypu, or Maipo, which disembogues at 11 miles from Toro Point; a bar extends across its mouth, and stretches for nearly 2 miles to the northward, parallel to the shore.

San Antonio.—At 3 miles North of the Maypu is San Antonio Cove, a small place affording indifferent shelter to a few vessels, and immediately under a pointed hill. At about a mile North of this hill there is a diminutive cove, called *La Bodega;* but large boats frequent it occasionally. The bottom off the latter is rocky, and vessels should not go within a depth of 14 or 15 fathoms.

Cartagena Beach, 5 miles northward of La Bodega, is quite exposed to S.W. winds. Tres Cruces Point is low and rocky; and 5 miles N.W. of it is *White Rock Point*, so called from the remarkable appearance of the white rock, a good landmark. A *sunken rock* is said to lie 4½ miles West, *true*, from the point. *Farallones de Algarrobo* are a cluster of small islands, about 5 miles northward of White Rock Point, and N. by W. ½ W. about 1 mile from Blanca Point. About half a mile E.N.E. of them is a 5-fathoms shoal, on which the sea breaks during westerly gales.

Westward of *Blanca* or *Algarrobo Point*, 3½ miles North of White Rock, there is a cove, where small coasters find temporary shelter during southerly winds. *Algarrobo Road*, about 1½ mile north-eastward of Blanca Point, has depths of 7 to 16 fathoms, and anchorage may be obtained in 15 fathoms, with

Algarrobo village bearing S.E., distant 1 mile, and Pajaros Niños Island in line with Blanca Point. About Algarrobo Point the coast is cliffy, but the cliffs are dark-coloured; the land in the neighbourhood is high and rather barren, of a dark colour, generally of a brownish hue. In the distance the Andes, stretching from North to South, show their majestic height, and appear much nearer than they are in reality.

Gallo Point is a steep cliff, 7 miles North of Algarrobo Point; between them are two sandy bights, divided by a rocky point. At the corner of the northern bight, called Tunquen, and close under Gallo Point, a boat might find shelter in a northerly wind, but there is no place for a sailing-vessel. Steep cliffs extend 6 miles North of it to *Quintai Cove*, which affords no good anchorage. *El Fraile Rock* lies N.W. ½ N., 8½ cables from Loros Point, the South point of Quintai Cove, but its vicinity has not been examined.

Curauma Head.—From thence the steep cliffs extend 3 miles to Curauma Head, a remarkable promontory, and one that demands special notice, because it is generally the first land made out distinctly by ships approaching Valparaiso from the southward. The head itself is a high cliff; above it the land rises steeply to the two high ranges of Curauma, the high one being 1,830 ft. above the sea, and 2 miles inland N.E. of the head. Usually when first made out from seaward, the high part of the range of Curauma appears directly over the head, and, if tolerably clear weather, the Campana (Bell) de Quillota is seen in the distance, 6,200 ft. high. If the Andes are also visible, *Aconcagua Volcano* will at a glance be distinguisable by its superior height of 23,200 feet.

CURAUMILLA POINT.—Projecting 4 miles W.N.W. from the heights of Curauma, is the well known point Curaumilla, on which it was proposed to construct a *lighthouse*. Curaumilla Point, low by comparison with the neighbouring land, though not so really, is rugged and rocky; two or three islets lie close off it. From Curaumilla Point, Angeles Point, the N.W. extreme of the land forming Valparaiso Bay, bears N.E. by N., distant 7 miles; between them is a deep angular indentation, bordered by scattered rocks on the West side, and steep cliffs on the East.

VALPARAISO is now one of the principal commercial places on the western coast of South America, its population, at the last census, in 1875, amounting to over 100,000 souls. It has been described by numerous travellers, whose accounts will afford a history of its progress. It lies in the southern part of the bay, behind Piedra Branca, or Angeles Point, on which stands the lighthouse.

Valparaiso Bay is about 2½ miles wide and 1¼ mile deep. It is entirely open to the North, and with strong weather from that quarter there is a very heavy sea sent in, which occasions much mischief. When the barometer falls low, or to less than 29·80, a signal is shown from the Exchange, "prepare for bad

weather." It is a certain indicator. The port has no shelter whatever for the shipping coming here, except what the open roadstead affords.

The city is built on a small triangular plain or strip of land, enclosed by *cuestas*, or radiating ridges of 1,000 to 1,400 ft. high, which in the western part, or the port, leave only a narrow line sufficient to build a row or two of houses, and even these stand on artificial bases formed of the material made by the cutting away of the cliffs in the rear for building purposes. Thus the custom-house is built with two sides against the rock. Much of the foreshore has also been raised by the effect of earthquakes, which may at some time swallow up what it has formerly upheaved. A well-built mole extends from the plaza in front of the custom-house and exchange. The port is separated from the larger portion of the city, or the Almendral, by a projecting point, in which was a cave, the Cueva del Chivata, formerly infested by a gang of desperadoes, and called by the sailors Cape Horn. In the rear of the port are two ravines, which form the districts called the Fore-top, Main-top, and Mizen-top. The West point of the bay is San Antonio Point; on it are some batteries and barracks, and a pile of bonded warehouses has been erected at its base, near to which is a ship-yard. The old Fort San Antonio has been demolished, and a mole (now nearly finished) extended about 100 yards in an easterly direction from its site, and thence in a northerly direction about 250 yards, with a depth of 30 ft. on the East side, and 28 ft. on the West side. It is proposed to show a *red light* on its North end.

Light.—A *bright*, *blue*, and *red* revolving light is shown on the customs' mole as a guide for landing.

Docks.—There are two floating docks, both capable of taking vessels of 1,400 to 3,000 tons. The *Santiago*, one of these, opened in 1865, is 300 ft. long, 62 ft. 8 in. broad inside measurement, and 35 ft. high. These docks were greatly wanted, as heaving ships down was expensive and tedious. The process of heaving down can be done with safety during the fine weather from September to May. *Steam-tugs* for towing may be had, and for weighing anchors; also for creeping for lost anchors, for which they have all necessary appliances. Valparaiso is in *telegraphic* communication with Europe, and the principal ports.

Supplies.—Valparaiso is the best port for supplies and repairs on the West side of South America; beef, vegetables, and stores of all kinds are plentiful, and comparatively cheap. *Water*, generally of good quality, is supplied from steam tanks at 1½ or 2 dollars the ton. The water sometimes supplied is brackish and unwholesome, and in the summer of 1868-9 H.M.S. *Topaze* had to distil water for her own use. The imports, in 1879, amounted to 20,778,533 dollars, and the exports to 15,080,065 dollars. In 1880, 1,119 vessels, with a total tonnage of 700,250 tons entered this port, of which 504, with a total tonnage of 430,755, were British.

Anchorage.—The best anchorage in Valparaiso Bay is close off San Antonio

mole, in from 15 to 20 fathoms, or in the S.W. corner of the bay; but the holding ground of sand and shingle is not so good in shoal water. In April, 1867, H.M.S. *Reindeer* dragged from her berth, in 10 fathoms with Baja Rock N.W. ¼ N., and Fort San Antonio (now demolished) S. by W.; but occupied as that part always is, a vessl must take as good a berth as she can find, the general depth being from 25 to 35 fathoms. During summer, the closer in shore the better; but during winter, on the outside of other vessels, if it can be managed, so as be safe from their driving during a northerly gale, which sends in a heavy sea. Moorings for the mail steam-vessels have been laid down in a north-easterly direction from the North end of the custom-houses.

The railway from Valparaiso is the finest in the country, and is state property. It extends 116 miles to the southward, through Santiago to Curico, and terminates at Angol beyond Curico, in lat. 37° 47′ S.

The Pacific Steam Navigation Company have lines of steamers which connect Valparaiso with all the ports between Chiloe and Panama.

The Lighthouse of Valparaiso stands on Piedra Blanca or Angeles Point, at the end of a plain called Playa Ancha, about 3 cables' lengths from Baja Rock, and 1¼ mile from the custom-house of Valparaiso. The tower, 49 ft. high, is circular, and painted white, showing a *fixed bright* light, with a *flash* every 2 minutes, preceded and followed by a short eclipse; the light is elevated 180 ft. above high water, and may be seen in fine weather at the distance of 16 miles.

To vessels coming from the southward the light will first appear from behind Curaumilla Point, bearing N.E., and may then be steered for, on which course a vessel will clear Point Curaumilla, and its dangers, as far as Piedra Blanca, or the point of Valparaiso Bay. To this point the berth of a mile should be given until the lighthouse is brought to bear South, when all its dangers will have been cleared.

Buei Rock, breaking only in heavy weather, is about 20 ft. in extent, has 12 ft. over it at low water, with 5 fathoms close around; it bears N.W. by W. ⅛ W., 3½ cables from Angeles Point lighthouse, and is nearly 2 cables from the nearest part of the point. About two-thirds of a cable inshore of Buei Rock there are several detached patches, which uncover, and border a shelving rocky ledge that extends in a north-westerly direction from the shore between Angeles Point and Magazine Bay, to the distance of about a cable. An *Automatic Signal buoy*, painted *red*, is moored in 19 fathoms, about half a cable N. by E. ¾ E. from Buei Rock, with Curaumilla Point bearing S.W. by S. ¼ S.; Angeles Point lighthouse, S.E. ¾ E.; and Baja Rock E. by S. Vessels entering the bay should not approach Angeles Point to a less distance than 4 cables, nor come into less than 25 fathoms, until the lighthouse bears S.E. by S. Curaumilla Point well open of the land West of Magazine Bay, leads north-westward of Buei Rock.

The rocks called the *Baja* lie E.N.E. 1½ cable from Piedra Blanca; they are

always above water, and are about 55 yards from North to South, and 27 from East to West. After passing Baja Rocks the vessel may freely enter the bay, and anchor in from 12 to 30 fathoms, sand and mud.

Vessels bound to Valparaiso should make the coast about Curaumilla Point, during ten months of the year, as the wind prevails then from the southward; but it should be observed that, even in fine weather, the mountains will be seen before any part of the coast can be distinguished, so as to enable a vessel to make the port. Among those the volcano of Aconcagua is conspicuous, from its great elevation, 23,200 ft., and from its summit being nearly always covered with snow. The highest or western part of it has an irregular outline marked by several peaks, but the S.E. part is entirely plain and even. When the summit of the volcano (which is 88 miles from Valparaiso) bears N.E. by E. ¼ E., it will be on the line of bearing of the lighthouse.

There is, at 25 miles from Valparaiso, another remarkable height called the *Bell of Quillota*. The middle part of its broken summit is called the Bell, and when it bears E.N.E. it will be on the line of bearing of the lighthouse. As these two peaks are the first seen in making the land, they serve well to direct a vessel to the lighthouse.

Coming from the northward, and having made Quintero Point, which is 20 miles northward of the lighthouse, care must be taken not to approach too near the coast in the night, as some sunken rocks lie 1½ mile westward of the point. There is a channel between them, but it is too dangerous to be attempted without a skilful pilot.

The *Look-out*, from whence signals are made, is 3,940 yards inland from the lighthouse, and 1,072 ft. above the sea.

The following remarks on making the land about Valparaiso are by the late George Peacock, Esq., Marine Superintendent of the Pacific Steam Navigation Company :—

All vessels bound for Valparaiso should endeavour to make the land about Curaumilla Point, and by no means approach the coast in the neighbourhood of Rapel Shoal, as the heavy S.W. swell sets right down upon this highly dangerous part of the coast, as well as the prevailing current, which sometimes runs upwards of a knot an hour round Topocalma Point towards the shoal; and in thick weather, on approaching the land at night, the greatest attention should be paid to the *deep sea lead, which ought to be kept ready on deck for immediate use*, as soundings may be obtained at from 2 to 6 miles, and even in some places 12 miles off the land.

About 24 miles South of Curaumilla Point, and 4 or 5 miles off White Rock Point, a sunken rock is said to exist, but I think its existence is very doubtful; nevertheless, it would be advisable not to come in with the land to the southward of the parallel of 33° 15′ S. in the summer, nor 33° S. during the winter months, *i.e.*, in June, July, and August. I have known the current in these

months set to the southward a mile an hour at intervals, and northerly gales are very prevalent at this season of the year.

In entering the Bay of Valparaiso with southerly winds, care must be taken to reef in time, for however moderate and steady the southerly winds may be in the offing, squalls blow from the high land into the bay, which are not to be disregarded. When it is blowing fresh outside from the southward, so as to require one reef in the topsails on a wind, probably treble-reefed topsails without the mainsail will be quite sail enough in the bay; when it is blowing strong in the offing from the same quarter, close-reefed topsails, over reefed courses, or over a reefed foresail only, will be quite as much as can be carried. Should a ship find it blowing too hard to work up to an anchorage, she had better stand out, and remain under sail off Angeles Point till it moderates, which it generally does in a few hours.

In the event of a ship approaching with a northerly wind, likely to blow strong, she should keep an offing till the wind has shifted to the westward of N.W., which it always does after some hours of strong northerly winds.

A norther, as it is called, often passes over without doing damage, but at intervals the effects are most dangerous, and all the ill-secured or ill-placed vessels are driven ashore. The safest anchorage in the event of a norther is about a cable off the point next outside San Antonio Point, for vessels here are better protected from the N.W. and westerly swell, which follows the N.W. gales, than further out in deep water. As the edge of the bank at this part (and it may be all along this side of the bay), drops suddenly from 17 or 18 fathoms to 35 fathoms, vessels bringing up here should be careful to let their anchor go on the bank, and not immediately outside, for in the latter case, when the bight of the cable draws up over the edge with any strain on it, the anchor trips, and so the anchorage in this bay gets a bad name.—Mr. Thomas Warr, Master of H.M.S. *Alert*, January, 1864.

To ride out a norther, one anchor with a long scope of cable is recommended. Some prefer riding near the shore, on account of the undertow, but in such a position you risk having vessels driven upon you, besides feeling the sea very much. In the summer, southerly gales blow in furious squalls off the heights. Clear weather and a high barometer presage strong southerly winds; cloudy weather, with a low barometer and distant land, such as the hill over Papudo, called Gobernador, or Cerro Verde, and the heights over the little port of Pichidanque, called La Silla, or on the coast northwards, being remarkably visible, are sure indications of northerly winds.

On the 11th July, 1870, H.M.S. *Satellite*, anchored in 27 fathoms and 130 fathoms cable out, with Baja Rock bearing N.W. by W. ½ W., the Signal Hill S.W. by S. ¾ S., and the custom-house tower S. by W. ¼ W., rode out the heaviest norther that had been experienced for thirty-five years. The following are Navigating-Lieutenant J. G. O'Connell's remarks:—"The day previous the usual indications presented themselves. The morning of the 11th was dry

and hard, the barometer standing at 29·71 inches. In the afternoon a tremendous sea got up, when steam was raised in four boilers, the wind in squalls blowing a whole gale. At 10^h 30^m p.m., the barometer at its lowest was 29·65; at that time a tremendous sea was running, and so high that a large ship only one length off was hidden from view up to her lower mast. During the gale two vessels were drifted on shore and entirely destroyed. Amongst other damages the whole sea-wall was entirely demolished, and the estimated cost of injuries sustained was 800,000 dollars. The sea appeared to run much higher where we lay than it did farther in, and I should recommend the best anchorage abreast the custom-house, where a great deal of the sea is broken."

It is high water in Valparaiso Bay, on full and change, at 9^h 32^m; springs rise about 5 ft.

Concon Point and Rocks.—The N.E. side of Valparaiso Bay is formed by alternate beaches and rocky points, as far as Concon Point, behind which there is a cove, where boats can land in moderate weather. At 3 miles N.N.W. from that point are *Concon Rocks*, always above water, which should have a wide berth given to them during light winds, as there is usually a swell and a northerly current setting towards them from the southward.

Quintero Bay is roomy, and during southerly winds sheltered; it is quite open to the N.W. *Liles Point*, the West extreme of Quintero Bay, should not be passed too close, as *Malenas Bank*, on which there is a heavy sea in bad weather, lies three-quarters of a mile W. ¼ N. from it, and half a mile beyond that is another bank of about 10 fathoms, on which the sea breaks. The least depth found on this rocky bank was 6 fathoms, but shoaler spots may exist. A depth of 15 fathoms is found between it and the point. Quintero Bay affords spacious and good anchorage in the summer months, some even prefer it to Valparaiso, and a general opinion exists that it would be a preferable sea port for the capital than Valparaiso. The best anchorage is in 13 fathoms, half a mile East of Liles Point. Some shelter during northerly winds, and fresh water, when the season is not very dry, may be found at the N.E. corner of the bay, under Ventanilla Point. There is a little shoal or rocky patch on the West side, nearly 2 cables' lengths off shore, and 4 cables from the junction of the cliff and sandy beach at the S.W. corner; this shoal, called *Tortuga*, is marked by an iron bar supporting a white cylinder. *South Tortuga Rock*, awash at low springs, lies 2¼ cables S.E. ¼ S. from it.

The land between Quintero Bay and Concon is rather high and rugged; and all this coast has rather a barren and weather-beaten aspect, here and there only any trees being visible. During the winter and spring alone is there verdure near the sea coast.

Quintero Rocks, at 4 miles N. by W. from Liles Point, and 1½ mile West of Horcon Head, are above water, but low, straggling, and dangerous; they are

of a dark colour, and spread over half a mile of space. *Horcon Head* has a remarkable hole in the extreme point of the cliff; the cliffs are dark coloured, about 80 or 100 ft. high, and the land immediately behind them, though higher, is level. Inland are considerable heights, and in the distance the Cordillera of the Andes.

Horcon Bay.—At 1 mile E.N.E. from Horcon Head there is a landing place between projecting rocks; and good water and plenty of fish may be procured, as well as fire-wood, and fresh provisions in small quantities. The roadstead is good during southerly winds, that is, in effect, during nine months out of the twelve; and there is 10 to 15 fathoms water half a mile North of the landing place, over a clean sandy bottom. This bay was somewhat unaccountably omitted in all the Spanish charts of this coast.

Zapallar Cove, 10 miles northward of Horcon, is nearly a mile deep, and 3 cables broad, with 13 to 16 fathoms, sandy bottom, in the centre. Its shores are rocky, except the eastern, which is bold and sandy, and unapproachable at all times. The landing place is on the southern shore, at a stony point, in a creek leading to the village, and may be recognised by a mole used by lighters. Pigs, sheep, and poultry can be obtained, but beef and vegetables are scarce. *Water* is good, but scarce, and can be obtained in the N.E. extremity of the cove.

PORT PAPUDO is 13 miles from Horcon; between them the shore is steep, and free from outlying dangers. The high pointed hill over Papudo, called *Gobernador* or *Cerro Verde*, 1,020 ft. in height, is an unfailing landmark for this small open bay. *Zapallar Point*, at the West extreme of this bay, is low, and must have a berth of nearly half a mile. It is safe during nine months of the year, but quite the reverse during the other three. In the S.W. part of the bay is a small pier. There is a fresh-water stream close to the landing place; wood and small quantities of fresh provisions may be obtained. The exports consist of corn, wood, and copper. The channel eastward of Lobos Island, northward of the port, has a group of rocky shoals in it.

At 5 miles to the northward of Papudo, behind a low rocky point, is the mouth of the *River Ligua*, not navigable, nor does the bay afford anchorage for any but the smallest craft. *Point la Cruz de la Ballena* and *Muelles Point* are steep and bold-to, but *Bogota Rock*, of 12 ft. water, discovered in 1866 by the P.S.N. Company's vessel of that name, Capt. Holloway, lies 8 cables S.W. by S. ½ S. of Cruz de la Ballena Point, and only breaks occasionally. The coast should not be approached within 2 miles in this vicinity. The trend of the coast from Ligua River to Ballena Point is W.N.W. for 5 miles, then it trends about 5 miles to the northward, and finally West 4 miles, to Muelles Point, which is low, dark-coloured, and rocky. The shore round Muelles Bay is sandy, with low rocky points, backed, as all the coast is, by high land.

Pichidanque.—From Muelles Point to the western point of *Pichidanque*

Bay, the broken, dark-coloured, rocky shore runs nearly N. by W. ½ W. for 8 miles. This bay is sometimes called *Herradura*, from its horse-shoe form. But it leads to some confusion, from the bay to the northward having the same appellation. The high, saddle-topped hill of *Santa Ynez*, overlooking Pichidanque, is an excellent mark: it is 2,000 ft. in height, and only 2 miles S.E. of the harbour. The best anchorage here is close to the little island of *Locos*, on its East side, in about 5 fathoms water. This island, 59 ft. high, has a mast erected on it, as a mark for recognising the port. The mast is 69 ft. high, with a yard across, having a barrel on each end. The whole is painted white, and visible 5 or 6 miles off. Care must be taken to avoid a rocky patch, called the *Casualidad*, very dangerous, as there is neither ripple nor weed upon it in fine weather, though it breaks when a swell sets in rather heavily. This rock, with about 6 ft. water on its shoalest part, lies 1¾ cable N.E. ¼ N. from the North end of Locos Island. At the N.E. part of the harbour is a gully, through which a river runs from the neighbouring village of Quilimari. It is high water, on full and change, at $9^h\ 20^m$; springs rise 5 ft.

Pichidanque is used occasionally for loading copper ore, or for smuggling affairs; there are only a few fishermen's huts near the harbour, but at the village of Quilimari, behind the nearest hills, supplies can be obtained. It is not a good place for watering. In sailing along the coast, near Pichidanque, care should be taken to avoid a few outlying rocks, which may be seen by day close to Salinas Point, and those which lie half a mile off shore, 3 miles N. by W. from Locos Islet.

Tapado Shoal, on which the sea breaks heavily, lies nearly 2 miles N.N.W. from Quelen Point, the northern point of Pichidanque Bay, and three-quarters of a mile from the shore; the channel between Tapado Shoal and the mainland is foul; it is otherwise steep-to.

Changos Point, in 31° 59′ S., is low and rocky, with some breakers off it. Between it and Lobos Point, N. ¾ W., 3 miles distant, is *Negro Bay*, dangerous to approach on account of the constant S.W. swell. It has, however, several landing places for boats in it. *Lobos Point* should not be approached under a mile, as several islands and rocky shoals lie off it. Between Lobos and Vilos Points is Guereo, useless for landing or anchorage, and 4 cables West of Vilos Point is *Huevos Island*, rocky, barren, and of a yellowish colour. It has a rock above water, off its S.W. end.

Conchali Bay, which lies between Vilos Point and Cape Tablas, 3⅓ miles N.W. by N. ¼ N. from it, has a cluster of three islands in its centre. In it are two anchorages, Vilos Bay and Nagué Creek.

Vilos Bay.—At 1¼ mile N.E. ¼ N. of Huevos Island is Chungo Point, sandy, and of a whitish colour, but rocky at its extremity. Between these points is *Vilos Bay*, with an anchorage, at present much frequented by steam and sailing vessels; it is capable of containing many vessels, which lie at single anchor. Sometimes the S.W. swell reaches the anchorage, causing vessels to roll a little.

In anticipation of a heavy swell in the winter, vessels should either put to sea or run for Nagué Creek, N.N.W. of this bay.

The best anchorage for ships of any size is in 9 fathoms, sand and shells, N.E. of the highest part of Huevos Island, with the flagstaff of the captain of the port at the western extremity of the town bearing South. Vessels of light draught anchor nearer the shore, but the bottom is irregular and sandy, with large stones. Fresh provisions can be obtained; vegetables are scarce during the summer season. The water, collected in pits near the village, is brackish; that of Conchali is excellent, but only a moderate supply can be obtained. It is high water, on full and change, at $9^h\ 44^m$: springs rise $5\frac{1}{2}$ ft.; ordinary rise, $4\frac{1}{2}$ ft.

Nagué Creek.—At $1\frac{1}{3}$ mile north-westward of Chungo Point is Penitente Point, precipitous, with a remarkable rock at its extremity. N.N.W. of Penitente Point is Nagué Creek, about 5 cables wide and the same distance in depth. There is from 4 to 10 fathoms water, sand, decreasing gradually towards the northern shore.

The creek is much too small for sailing vessels, and entirely exposed to south-westerly winds. The landing place in the creek is North of Point Conchas, close to the rocks, but should not be attempted in bad weather. *Water* is excellent; fish and cockles plentiful. This creek is of considerable importance, being the only one where vessels find real shelter from westerly winds which prevail during the winter.

Conchas Point, the western extremity of Nagué Creek, is surmounted by a sandy hill, 105 ft. in height. Its shores are rocky, from which extends a ridge of sunken rocks towards Verde Island. South of this point is a small creek, and West of it is a second, neither of which can be recommended as landing places.

From Conchas Point the coast extends W.S.W. for $1\frac{1}{3}$ mile, forming the southern shore of a projecting and dangerous cliffy headland, 265 ft. high, named *Cape Tablas*, in lat. 31° 51′ S. It is surrounded with breakers.

Penitente Rock, or *Roca Corales*, awash at low water, lies $1\frac{1}{3}$ mile S.S.W. of Cape Tablas, with two other small rocks close on its S.W. side.

In *Tablas Bay*, eastward of Cape Tablas, the bottom is sand or sand and stones, and the anchorage good, in 12 fathoms, well sheltered, and calm with southerly winds, but westerly winds are very boisterous. S.S.E. of the anchorage is a small rocky point with a white rock at its extremity, eastward of which is the best landing. The place is without resources and water, unless obtained at Nagué, distant about half a mile; but game is abundant, especially partridges. *Pechonas Point*, forming the northern extreme of Tablas Bay, is rocky and precipitous, 256 ft. high, the breakers extending 2 cables off it.

Linlenes Island, 2 miles N.N.E. of Cape Tablas, is high, nearly round, of a grayish colour, and about 400 yards in diameter, and without off-lying danger. Half a mile W.N.W. of Linlenes Island is *Cebollin Rock*, on which the sea

breaks at high tide; there is 16 fathoms, with a stony bottom, at less than a cable's distance round the rock.

Chigualoco Bay, between Cape Tablas and Loberia Head, 6½ miles N. ¾ W. from it, has no anchorage, being entirely exposed to the prevailing S.W. and West winds. *Boca del Barco Creek*, bearing N.N.E. 4¾ miles from Cape Tablas, has a good landing place in its S.W. part on a gravel beach. In the middle of the creek is a rock, visible, and two more under water N.W. of it. The depth varies from 4 to 8 fathoms, mud. Vessels loading in this creek anchor 3 cables westward of Point Salina in 12 or 13 fathoms, sand and stone. The S.W. swell makes the anchorage uncomfortable, but it is in every way preferable to Chigualoco Bay.

Chigualoco Creek.—Between Boca del Barco Creek and the high part of Loberia Point is a rock half a mile off, called Bajos de Chigualoco, united to the shore by a sand-bank. North-eastward of it is the creek bearing this name, but, as already stated, it is nearly useless and dangerous to approach, on account of the heavy breakers. The anchorage, in 7 to 12 fathoms, sand, is entirely exposed to the southward, but with westerly winds it is said to be sufficiently sheltered by the before-mentioned shoal. The coast is low, rocky, and sloping towards the shore; at 1½ mile inland the hills rise to a height of 2,000 to 2,500 ft.

To N. by W. of Bajos de Chigualoco is a point slightly projecting, of a dark colour, and surrounded with rocks, called La Mula Muerta. Between this point and Loberia Point are two creeks, separated by the small point Las Conchas; the first, called Mostaza Creek, has a landing place in fine weather, but a pilot is indispensable. S.S.W. of it are breakers extending over half a mile southward of Point Conchas into the sea, and S.E. ½ S. from the rock off Loberia Point. The village of Chigualoco is situated N.E. of Chigualoco Creek.

Loberia Point is of moderate height, rocky, and surrounded with breakers to 1½ cable off. Inland appears a mountain range 2,000 to 2,500 ft. high. The coast is precipitous, and continues 5 miles in a northerly direction until joining *Huenteláuquen Creek*, which is sufficiently protected from the southern swell, and though only of small extent may become very important to the provinces Illabel and Combar-bala, there being no other convenient port known along the whole coast. A small, low, and rocky island protects the anchorage against the sea and prevailing winds. Huenteláuquen Creek can only admit vessels of not more than 300 tons, and only two at a time. There is neither drinkable water nor resources of any kind; the neighbouring district is prosperous and fertile.

Pozo Point bears from Huenteláuquen Creek N. ¾ W. It is precipitous, and numerous rocks extend some distance off. The summit of the point is smooth and barren. Towards the S.E. is a small creek, where boats can obtain a landing in case of need. N.W. ½ W. from Point Pozo, and N.W. by N. ¾ N. from Loberia Head, is Ventana Point. Between these points the coast makes a short

bend eastward, forming Choapa Creek, which is of no importance. Near it Choapa River empties itself into the sea, but the water supply is greatly reduced by the many canals made for irrigating the neighbouring district. The open plain through which the river passes, more than 1½ mile wide, is fertile, well cultivated, and rich in various productions. *Ventana Point* is low, projecting, and dangerous, on account of some off-lying rocks which are not always visible. Behind the point is a chain of hills, forming the northern limit of the fertile plain of Choapa.

About 10 miles N.W. by N. ½ N. from Ventana Point is *Oscuro* or *Tatoral Cove*, about 4 cables long by 1½ cable wide, with anchorage for small vessels in 11 fathoms, sand, near its centre. Two sunken rocks, on which the sea breaks heavily, lie three-quarters of a cable southward of Burro Point, the North point of the entrance. Sailing vessels can easily enter, but should be towed out during the morning calms.

The landing place is in the S.E. corner of the cove, and at the Tatoral estate, about 1 mile distant, a small supply of provisions can be obtained. Between the houses and the cove there is a stream of good water; there is also a small watering place about 100 yards from the beach.

Maytencillo, 22 miles northward of the River Choapa, is a little cove, fit only for Balsas; at certain times a boat may land there, but there are many hidden rocks. Its situation is pointed out by a large triangular space of white sand, having an artificial appearance, on the face of the steep cliffs which here line the coast; this mark is made by the sand that is drifted by the eddy winds against the North side of the cove. At 1 mile South of Maytencillo, a rocky shoal, awash, extends half a mile seaward; it is about a mile long North and South.

From that cove the coast extends in an unbroken line 33 miles N.N.W. to the next opening, which is that of the *River Limari*, which drains the western slope of the peak of that name; the opening here looks large from seaward, but it is inaccessible. The coast near Limari is steep and rocky. For 10 miles North of Maytencillo the coast is composed of blue rocky cliffs about 150 ft. high; the land above the cliffs rises to between 300 and 400 ft., and then about 3 miles farther in-shore the range of hills runs from 3,000 to 5,000 ft. in height.

Mount Talinay is a remarkable hill, 2,300 ft. high; it is 3 miles from the coast, and 7 miles southward of the river; it is thickly wooded on the top, but the sides are quite bare. To the S.W. of Mount Talinay, and about three-quarters of a mile off shore, lies *Pilcomayo Rock*, awash, in lat. 30° 53′ 6″ S.

About 14 miles northward of Limari there is a small bay, with a sandy beach in the North corner, but a heavy surf. From this bay to the northward the coast is rocky and broken; and about 8 or 9 miles farther is a small rocky peninsula, with a high sharp rock rising from its centre, and a small deep cove South of it, without landing, called *Tortoral della Lengua de Vaca*.

Lengua de Vaca, 8 miles farther, is a very low rocky point, rising gradually in-shore to a round hummock, 850 ft. high, about a mile to the southward of the point. There are rocks nearly awash about a cable's length from the point, and at 2 cables distant there is but 5 ft. water. *Bolivar Rock*, on which the vessel of that name, drawing 18 ft., struck in 1876, is said to lie about 1½ mile N.W. by N. ¼ N. from the point.

TONGOY BAY.—After rounding the Lengua, the coast turns short to the S.E. into *Tongoy Bay*, and is rocky and steep for about 2 miles from the point, where there is 15 fathoms about half a mile from the shore. About 3 miles from the point a long sandy beach commences, which extends the whole length of that large bay as far as the *Peninsula of Tongoy;* the South part of the beach is called *Playa de Tanque*, and the eastern side of the bay *Playa de Tongoy*. Off the S.W. end of the beach near Tanque there is anchorage about half a mile from the shore, in from 5 to 7 fathoms; the bottom is a soft muddy sand in some places, but in others it is hard. With a southerly wind the bay is smooth, and the landing good, but a heavy sea sets in with a northerly breeze. The village, which is called the *Rincon de Tanque*, consists of about a dozen ranchos. The only water to be had is brackish; about 2½ miles to the E.N.E., where there is good water, the landing is generally very bad, besides which the water is some distance from the beach.

All the way from Tanque to the peninsula of Tongoy there is anchorage in any part of the bay within 2 miles of the shore, in from 7 to 10 fathoms, sandy bottom. There is also good anchorage with a northerly wind, for small vessels, to the S.W. of the peninsula, abreast of the small village on the point, with the West extreme of the peninsula bearing N.W. by W., in 4 fathoms, sandy bottom, with clay underneath; but no vessel, however small, should go into less than 4 fathoms, as the sea breaks inside of that depth, when blowing hard from the northward. Even large vessels might find a little shelter there with the wind to the northward of N.W.; the best anchorage for them is in 7 fathoms, with Range Peak and the church spire in line, bearing N.E. by N. ¼ N., and the chimney in line with Morgan Rock N. ½ W. With a strong south-westerly breeze the sea across the bay would render any vessel unable to remain at anchor in this berth, but Barnes Bay, on the North side of the peninsula, is completely sheltered from southerly winds. In the S.W. corner of this small bay there is a small creek, into which, when smooth, boats can go: it runs about a mile inland, and near its head there is fresh water.

Tongoy.—The village stands on the high point on the South side of the peninsula on the N.E. side of the bay. It is of rising importance, as being the outlet of the great mining wealth of the province of Ovalle, which lies between it and Limari Peak. It embraces nearly all the basin of the River Guamalata, and copper mines are actively worked. Lapis-lazuli is also worked on the secondary plateau of the Andes near the torrent Mostazal. But the principal metalliferous area is at *Tamaya*, on one mine of which, the Pique Mine, 4,000

men were employed in 1866, and raised 35,000 tons of ore, yielding 7,000 tons of copper. A *railway* connects Ovalle with Tongoy, with a branch to Tamaya.

At about 1 cable South from the high chimney of the smelting works there is a rock which is covered at high water, and at low water just awash. There is (or was) a perch on it to mark its position, which is dangerous, as it is just the place where strangers would bring up their ships as in a convenient berth for discharging. *Cousino Rock*, with 12 ft. water, and 5 to 9 fathoms close around, lies S.W. $\frac{3}{4}$ S., nearly three-quarters of a cable from the West extreme of Tongoy Peninsula.

There are some smelting works here, and large ore stations. The furnaces, when at work, can at night be distinguished at sea. Part of the shore is embanked with copper slag, and there is a mole, alongside of which small coasters load and discharge. Larger vessels are laden and unladen by launches. A screw steamer runs from here to Herradura, and can be employed for towing. There are two or three small stores, and ready access to Herradura. In summer time the place is frequented for bathing. In 1880, 1,978 tons of bar copper were exported.

To the northward of Huanaquero Hill, 4 miles to the N.E. of Tongoy, there is a deep bay, well sheltered from southerly and westerly winds, but open to the northward; between this and Port Herradura there is no place fit for a vessel.

HERRADURA de Coquimbo.—From Huanaquero Point it is 13 miles to the narrow entrance of Herradura de Coquimbo, a small landlocked harbour, separated from Coquimbo Bay by an isthmus about a mile in breadth. The entrance is only $3\frac{1}{4}$ cables wide, but vessels of any size may freely enter with a leading wind, by keeping the southern shore on board, in order to avoid a rock off Miedo Point; and when in may anchor in any depth they please, on a bottom of sand, covering very tenacious marly clay. In the S.W. angle they will find perfect shelter from all winds, and the water so smooth, that they carry on any repairs with the utmost security during summer. The *Beagle* lay there some weeks refitting; her crew encamped on the beach. In winter the swell finds its way into the port.

This landlocked and convenient bay would be of much importance if farther from Coquimbo, which has the advantage in size, but not in shelter; for during the winter months the northers are often severe, and sometimes send a heavy sea into the anchorage of that place, whilst in Herradura there is good shelter. The only disadvantage is that sailing ships sometimes find difficulty in getting out, as the entrance is narrow, and the wind draws through it into the bay, which, with the heavy swell that rolls on the coast and the deep water outside, makes it rather difficult for a deep-loaded ship, unless with a leading wind, which seldom prevails more than a few hours in the forenoon, and is mostly light and uncertain.

Mr. T. F. Price, in the English barque *Pembroke Castle*, discovered, in 1866, a dangerous rock in Port Herradura, with only 2 ft. water over it, and 5 fathoms close around it, at low water springs. It lies near the northern shore, with Cerro Alegre, a conspicuous round hill in the N.E. corner of the port, bearing N.E.; and the inner eastern point of entrance W. $\frac{3}{4}$ N., distant $1\frac{1}{2}$ cable. The *Pembroke Castle*, when entering the port, only just cleared this rock in picking up a berth, and the ship *Knowsley* ran on to it and stove her bows in. The directions given to avoid it are, not to bring Herradura Point to the southward of W. $\frac{1}{2}$ S., nor the South end of Cerro Alegre to the eastward of N.E. by N. In 1874 it was marked by a *red buoy*, in 6 fathoms, near its East side.

Guayacan.—In 1848 the Mexican and South American Company formed a large establishment at Herradura for smelting copper ores, and a town of about 1,000 inhabitants, English and Chilians, was formed. A boat mole was run out on the Whale Islands, and a long mole, at which vessels of 300 tons can discharge, has been constructed to the northward. For large vessels discharging, launches and peons can be hired. A small screw steamer is occasionally employed in towing ships in and out. The furnaces are constantly alight, so that ships can enter the harbour by night.

It is now one of the largest copper-smelting establishments, not only in Chile, but in the whole world, thirty to thirty-five furnaces being always in operation. It now belongs to the Chilean firm of Urmeneta and Errazuriz, and employs about 300 hands, of whom 40 or 50 are Englishmen, producing 5,000 to 10,000 tons annually; in 1880 it amounted to 5,872 tons. The population now amounts to about 1,500. Other establishments are at Panulsillo, 50 miles in the interior, belonging to an English company, and at Campaña, 9 miles from the port.

Herradura is a second-class port, and vessels have, therefore, first to enter Port Coquimbo for a pass. A large trade is carried on coastwise for ores and Chile coals. The foreign trade consists of the import of English coals, bricks, clay, iron, &c., and the export of bar-copper, copper regulus, and copper-silver ores to England, the United States, and Hamburg; vessels can obtain quick despatch, steamers sometimes loading 300 or 400 tons of copper in a day. About 20,000 tons of shipping yearly frequent the bay. The banking operations are conducted by the company, who issue bills on the coast, and on England. The water is brackish, but fresh water is regularly brought from Coquimbo Bay, at a cost of 2 dollars per ton. A large stock of coals is kept in the company's works. The South Chile coal is used here in large quantities; it is shipped at 5 dollars, and landed on the wharves at 9 dollars per ton, including all expenses.

Coquimbo Peninsula, separating Port Herradura from Coquimbo Bay, is about 2 miles long in a N.N.E. direction, and 1 mile across, the highest part

near the centre being 517 ft. ; Flagstaff Hill, at its S.W. part, is 305 ft., and Signal Hill, near the N.E. part, overlooking the town and Bay of Coquimbo, is 495 ft. above the sea. Ships approaching Port Herradura, or Coquimbo Bay, are signalled either from Flagstaff or Signal Hills, each hill having a flagstaff with a yard across.

COQUIMBO BAY, one of the finest bays on the West coast of America, is 7 miles wide between Pelicanos Head and Teatinos Point, and 3 miles deep, the anchorage in its S.W. part being well sheltered and secure at all seasons. Large vessels can moor close to the shore, and smaller vessels often discharge at the railway wharves. Even in winter one anchor and 45 fathoms of cable is usually sufficient for any vessel anchoring. It is the British Naval Station on the West coast.

If the lead be kept briskly going, when approaching either the eastern shore or the bottom of Coquimbo Bay, the chart will be a sufficient guide, as the water shoals gradually towards the beach, which is low and sandy. It is necessary, in going in, to give *Pajaros Ninos Islets* and *Rocks*, extending 1 mile N.W. $\frac{3}{4}$ W. from Tortugo Point, a berth in case of falling calm, lest you should be obliged to anchor, for the ground near them is rocky ; and for those reasons vessels are advised to pass outside of them.

The LIGHTHOUSE on Tortugo Point, on the southern side of the entrance into Coquimbo Bay, is square, built of wood, painted white, and 26 ft. high. It stands about 200 yards within the extremity of Tortugo Point, and exhibits, at an elevation of 98 ft. above high water, a *fixed* and *flashing bright* light, showing a flash, of *five seconds* duration, every *twenty seconds*, the partial eclipse lasting *ten seconds*, and in clear weather should be seen from a distance of 12 miles between the bearings of N.E. by E. $\frac{1}{4}$ E. and S.W. $\frac{1}{4}$ W., round by South. The Chilian Government propose to move this light to the Pajaros Ninos Rocks.

The western shore of the bay is high and bold, particularly at its northern end, off which lies an insulated rock, the *Pelicanos*, at from 40 to 50 yards N.E. by N. $\frac{3}{4}$ N., from the highest part of which is a sunken pinnacle rock, now named *Dorsetshire Rock*, with 9 ft. on it at low water spring tides, and deep water close outside it. Several vessels have struck on it. When bound to the anchorage off Coquimbo, on rounding or passing Pelicanos Rock, do not approach it under 1 cable, nor in thick weather come under 15 fathoms, and stand to the eastward towards La Serena until the conspicuous church spire near the centre of the town of Coquimbo comes in line with the extreme of Observation Point, bearing S. $\frac{1}{4}$ W., when she may haul in for the anchorage.

Havannah Rock is a patch of 6 fathoms, on which the lead would not rest, with 9 and 10 fathoms around it, and 12 fathoms between it and the shore, N. by E., $1\frac{1}{4}$ cable from Pelicanos Rock.

The land is remarkable, and easily recognised; and *Signal Hill*, being up-

wards of 500 ft., can be easily made out at a moderate offing; but in approaching this port vessels must guard against being swept to the northward by the prevailing swell, current, and wind, which almost always come from the S.W. The port may easily be entered at night with the aid of the light on Tortugo Point, and of the constant light shown by the furnaces. Coming from the southward, run along at 3 miles from the land, until the lights at the town of Serena bear E. by N., then steer for them on this bearing, which will clear Pajaros Rocks, and when the furnace lights open of Pelicanos Rock, bearing S. $\frac{1}{4}$ W., the vessel can haul into the bay, and anchor in 8 fathoms. Should the lights at the town of Serena be obscured by mist, the lights of the shipping at anchor in Coquimbo Bay will sometimes serve as a guide to the anchorage, after losing sight of the light on Tortugo Point.

The usual anchorage for strangers is in 8 fathoms, with the extreme North point of the western shore N.W. $\frac{1}{2}$ W., the church at La Serena (or town of Coquimbo) N.E., and the houses near the landing place S.W. $\frac{1}{2}$ W. The best anchorage is in 6 fathoms, in the S.W. angle of the bay, and the holding excellent; but a swell usually rolls in and produces such a surf along the beach that landing is difficult, except in a few sheltered spots. The winds at Coquimbo are in general moderate and southerly, or chiefly off shore, during the greatest part of the year, and are interrupted for short intervals only in winter by strong breezes from the N.W. In short, the weather is so uniformly fine, the climate so charming, and the atmosphere so clear, as to have given to the city the name of La Serena.

Fogs are of frequent occurrence, and cause much delay to boats proceeding to and from the ship in Coquimbo; and, as a rule, no boat should leave the ship without being provided with a compass.

Coquimbo is on the western side of the bay, and was founded by Valdivia in 1544. Most of the houses are of slight materials, both from the frequency of earthquakes, and from the absence of rain. But since the increase of the copper trade, some better buildings have been constructed. The population now amounts to about 5,000. There are smelting works at each end of the town. Besides these there is a church, a hospital with thirty beds, and a custom-house, and the post-office is a building near the mole. The Railway Company own a pier, alongside which there is 22 ft. water, where ships can be loaded and discharged by cranes. All kinds of provisions, plenty of good water, supplied by a tank-vessel, and coals can be obtained. There is *telegraphic* communication with Europe and the principal ports. In 1880, exclusive of the mail steamers, the total tonnage of vessels entering this port amounted to to 85,618, of which 41,219 was represented by 66 British vessels.

Light.—A *red* and *yellow revolving* light is said to be exhibited on the end of the customs mole.

Copper.—The export of copper from Coquimbo, in 1873, amounted to 15,000 tons, or about one-third of the total export of that article from Chile.

The whole of this, with the exception of one small cargo, was sent to the English market, mostly by the steamers of the Pacific Steam Navigation Company, which call here three times a week each way. In 1879 the value of the exports amounted to 6,186,192 dollars, including 2,908 tons of bar copper, which is exclusive of that exported from Guayacan.

The *Coquimbo Railway* was opened for traffic in April, 1862. It runs to La Serena and the mines at La Campaña, a distance of about 9 miles. It farther extends to Ovalle, 61½ miles distant, passing through the important mineral districts of Andacollo, Tambellos, and Las Cardas.

La Serena.—The town of La Serena, on the N.E. side of the bay, with a population of about 15,000, and 9 miles from the port, is clean, and tolerably well laid out. The streets are straight, and intersect each other at right angles, like other Spanish towns. The houses, to each of which is attached a garden, are shaded by myrtle trees. The town, and its grounds, are supplied with water by canals, cut from the river on its North side; and, by its irrigation, increases the fertility of the place. The houses are mostly of sun-dried bricks, and only one story in height, so built in consequence of the earthquakes to which all Chile is subject. There are seven churches and other public buildings. Mr. Darwin says that "the town is remarkable for nothing but its extreme quietness," a character quite appreciable at the present day; but all travellers unite in lauding the kindness and hospitality of the inhabitants.

There is no landing near the town of La Serena, which is 1 mile from the sea, in consequence of the heavy surf, except on balsas. Some breweries have been recently established here, and have hitherto prospered.

Teatinos, the northern point of Coquimbo Bay, is bold and rugged, the land behind rising in ridges, which gradually become higher, as they recede from the coast to *Cobre Mountain*, which is 6,400 ft. high. The point, which makes as the North extremity of the bay in coming from the northward, is low and rocky, called *Poroto*, about 4 miles to the northward of which is the port of *Arrayan*, or *Juan Soldado*, but it does not deserve any name, it being merely a small exposed bight. A little to the northward of Cobre is another mountain in the same range, called Juan Soldado, 3,900 ft. high. Its northern side is steep, and at its foot lies the small unsheltered *Bay of Osorno*, which is about half a mile long, but it would not afford any shelter for the smallest vessel. About half a mile to the northward of the bay there is a hamlet, consisting of a few small houses, called *Yerba Buena*.

The Pajaros are two rocky islets, 100 to 150 ft. high, lying about 12 miles from the coast, and 23½ miles N.W. ½ N. of Tortugo light. A reef extends southward from the southernmost. A little to the northward of Yerba Buena there is a small island called *Tilgo*, separated from the shore by a channel about a cable's length broad, but it is only fit for boats. The island, except when very close, appears to be only a projecting point; there is a large white rock on its West point.

Tortoralillo.—About 3 miles to the northward of Tilgo Island is the port of Tortoralillo, which is formed by a small bay facing the N.W., with three small islands off the West point. *Zoraida Rock*, about 20 yards in extent, with 14 ft. water over it, lies 3 cables N.E. ¼ N. from the northernmost of the islands; the sea generally breaks over it. In coming from the southward the best entrance for small vessels is between the southernmost island and the point, where there is a channel about a cable's length wide, with from 8 to 12 fathoms water; the dry rock off the point on the main land should not be approached nearer than half a cable, as a sunken rock lies nearly that distance westward of it. There is no channel between the islets, as the space is blocked by breakers. The anchorage is about 2 cables eastward of the largest island, in 9 to 12 fathoms, sand; the bottom in all other parts of the bay is rocky. In entering the bay the northern small island, on which is a flagstaff, may be rounded within 1 cable. The landing is not good; the best is on the rocks near the entrance, but nothing could be embarked from thence; the East end of the beach is the best for that purpose. From the land to the northward running so far westward, it is not likely that a heavy sea would be caused by a northerly gale.

The village of Tortoralillo is a straggling, untidy place, about 1,900 ft. above the sea. The port has a large establishment for the extraction of silver from the ores, and also a large copper ore station and some smelting works; a small mole has been built for shipping the produce. In 1880, the export of copper bars amounted to 3,315 tons, and of ore 363 tons. Launches and peons can be obtained.

Temblador is a small cove to the N.E. of Tortoralillo, but the landing there is worse than on the other beach, and is not so well sheltered.

Chungunga.—About 4½ miles to the northward of Tortoralillo lies the small island of *Chungunga*, at about a mile from the shore, forming a good mark for knowing the little port of Chungunga: there is a rocky point abreast of it, and a little way in-shore is a remarkable Saddle Hill, with a nipple in the middle, which to a person coming from the southward appears as the end of the high range that runs thence to the eastward of Tortoralillo, and is from 2,000 to 3,000 ft. high. A little to the northward of Chungunga Point there is a large white sand-patch, which is seen distinctly from the westward; it is at the South end of the Choros Beach, which runs for 7 or 8 miles to the N.W. to Point Choros; a heavy surf always breaks upon it.

Choros Islands.—Off *Choros Point* there are three islands; the inner one is low, and so nearly joins the shore, that nothing but a boat can pass. About 2 miles W.N.W. of this island there is another small island, and between them the channel is clear of danger. About a mile South of the latter lies the largest of the Choros Islands; it is about 2 miles long, the top is very much broken, and the S.W. end resembles a castle; there is a small pyramid off the South point, and rocks break about a quarter of a mile from the shore. The channel

between the two outer islands is clear of danger; but about half a mile to the westward of the northern island there is a rock nearly awash. At 5 miles S.S.E. of the southern Choros Island is the very dangerous *Reef of Toro*, only a little above the water. *Choros Bay*, on the North side of Cape Choros, affords anchorage in 6 fathoms.

Carrisal Point, about 7 miles to the northward of Choros Point, is low and rocky, with a remarkable round hummock: to the southward of it is the little *Cove of Polillao*, where there is shelter for small vessels, but the landing is bad; there are two small rocky islets off the South point of the cove. To the northward of Carrisal Point is the bay of the same name, but it is not fit for vessels, as a heavy surf breaks about half a mile from the shore. The North side of the bay is formed by a rocky point, with outlying rocks and breakers about a quarter of a mile off all sides of it; there is a landing place in the bay near the S.E. corner, where the rocky coast joins the beach, but in bad weather the surf breaks outside of it.

CHANERAL (South).—At nearly 1 mile to the northward of the North point of Carrisal Bay is Chañeral Bay, well sheltered from northerly and southerly winds, but the swell sets in heavily from the S.W., which makes the landing bad. The best landing is in a small cove on the North side near the beach; there is also a landing place on the South side of the bay, but it is bad when there is any swell. On the beach, in the bight of the port, there is always too much surf to land, except after very fine weather. About 4 miles to the westward lies the *Island of Chaneral* or *Chanaral*; it is nearly level, except on the South end, near which there is a remarkable mound, with a nipple in its centre. There are rocks nearly half a mile from the South point of the island, and one about the same distance off the N.W. point. On the North side there is a small cove, where boats can land with the wind from the southward, and there is anchorage close off it, but the water is deep; an American sealing schooner was lost there some years ago from a norther coming on while she was at anchor.

The land round Chañeral Bay is low, with ridges of low hills rising from the points; their tops are very rugged and rocky, and the land is sandy and very barren. A range of high hills will be seen several miles from the shore, but between them and the coast there are several smaller hills springing out of the low land. The village is about 3 miles from the port.

Point Leones.—From the North point of Chañeral Bay to *Leones Point*, the distance is about $3\frac{1}{2}$ miles N.W. by N.; the coast between is low, and falling back forms a small bay. Leones Point has several rocks and reefs extending from it to the distance of a mile; there is also a reef, which projects nearly a mile from the shore, a little to the northward of Chañeral Bay. From Leones Point the coast runs N. by W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles to *Pajaros Point*, and from thence about North $3\frac{1}{2}$ miles to Cape Vascuñan.

Cape Vascunan has a small rocky islet off it about 2 cables' lengths from

the shore. The land in-shore rises gradually to a low ridge about half a mile from the sea; the high range is about 3 miles in-shore.

Sarco Bay.—From Cape Vascuñan the coast runs in to the north-eastward, forming a small bay called *Sarco*, open to the northward, but well sheltered from southerly winds; there is anchorage in from 8 to 12 fathoms about one-third of a mile from the shore, but the landing is bad. Cargo is brought off in lighters from the small village; water and provisions are seldom to be had.

Next to the N.E. lies *Deep Gully Bay*, in which there is also shelter from southerly winds. To the northward of Deep Gully Bay the high land comes close to the coast; the sides of the hills are covered with yellow sand; the summits are rocky, and the whole coast has a miserable, barren appearance. About 4 miles to the northward of Deep Gully there is a projecting rocky point at the foot of a high range of hills, with a very remarkable black sharp peak near its termination.

Pena Blanca.—At 2½ miles north-eastward of the projecting point is Peña Blanca, which to vessels coming in from the westward will appear like a small sandy bay, as the foot of the mountains just here is sand, but there is very little to be seen till close in, and then only one or two huts. It cannot, however, be mistaken for Sarco (it has been) if a vessel makes out Alcalde Point, which is 8 miles N. ¾ W. of Peña Blanca. It is best to moor in about 10 fathoms, placing the port anchor to the southward, the starboard anchor to the westward, and the stern anchor to the eastward, as the swell mostly comes in from the westward.—(Capt. Sweet, barque *Pizarro*, 1861). Copper is shipped from here.

The coast to the northward of Peña Blanca runs nearly North, and is very rocky for about 6½ miles, when it turns to the westward, forming a deep bay, in the N.E. corner of which is a small beach called *Tontado*.

To the northward of the bay a high range projects towards *Alcalde Point*, the extreme point of the bay, which is nearly 8 miles to the southward of Huasco; the point is very rocky with small detached rocks close to it; in-shore it rises a little, and there are several small rocky lumps peeping out of the sand, one of which, from the southward, shows very distinctly; it is higher than the rest, and forms a sharp peak, a little in-shore of which the land rises suddenly to the break of the high range.

HUASCO.—At 6½ miles to the northward of Alcalde Point is the point forming the S.W. extreme of the bay in which is the port of *Huasco*, or *Guasco*;*

* At Huasco there is a similar natural feature to that described as existing in the Valley of Coquimbo, the ancient sea margins. "At Huasco the phenomenon of the parallel terraces is very strikingly seen; no less than seven perfectly level but unequally broad plains, ascending by steps, occur on one or both sides of the valley. So remarkable is the contrast of the successive horizontal lines, corresponding on each side with the irregular outline of the surrounding mountains, that it attracts the attention of even those who feel no interest regarding the causes which have modelled the surface of the land."—*Darwin, Journal, &c.*, page 423.

it is low and rugged, with several small islands between it and Port Huasco, one only of which is of any size, and it is separated from the shore by a very narrow channel, so as to appear from seaward to be a point of the mainland; it is covered with low rugged rocks, one of which, on its North side, is much higher than the rest, and shows distinctly coming from the southward, but from the northward it is mixed with the other rocks behind it. The top of the range in-shore forms three round summits, the easternmost of which, being 1,900 ft., is a little higher, and the middle one a little lower, than the other; they are all called the *Cerro del Huasco.*

HUASCO PORT.—Nearly 3 miles to the N.E. of the anchorage there is another range of hills about 1,400 ft. high, on the South slope of which there is a sharp peak, from which it slopes to the valley that conveys the river. The river is small, and a heavy surf breaks outside of it; the water, however, is excellent. The anchorage is much exposed to northerly winds, and a heavy sea then rolls in; but a mischievous norther does not occur more than once in two or three years. The town or village has a poor aspect, and contains only about 350 inhabitants, living in plank and adobe houses, which, with a church and a custom-house, are scattered among the rocks, on the point dividing the old and new ports. Fresh supplies and coal may be obtained here. The country round presents a more barren and miserable appearance than any part even of this desolate coast, but the valley, after the rains, is as green and fertile as any spot in England. Fresh water may be got up the River Huasco.

The port is to the eastward of a second and inner point lying 2 miles N.E. of Huasco Point, having two large rocks off it in a N.W. direction, which form the northern shore of the inner port, where vessels lie and receive copper. It is a blind and inconvenient anchorage; it is, however, one of the places at which the P.S.N. Company's steamers call, as it is the port of *Vallenar*, a considerable town in the interior. There is a smelting establishment half a mile from the landing place, where a good deal of copper is manufactured, and, with certain kinds of ore, sent to England. This port is connected with the *telegraphic* system.

On the night of the steamer's arrival a *light* is shown above the pier, which should be brought to bear S.E., but care must be taken not to mistake for this the flame from the tall chimneys of the smelting works, which show a redder and more uncertain light, as they would lead a vessel too near to the beach and on to the rocky ground which lies abreast them.

Anchorage.—H.M.S. *Reindeer*, in 1869, anchored in 7 fathoms, with Outer Rock W. by S., and the landing place S.S.W. Although a safe place for any vessel well found with ground tackle, owing to the moderate depth of water and good holding ground, Huasco is anything but a good place for dispatch. From May to September northerly winds prevail, causing great delay in landing or shipping cargo. Heavy rollers frequently set into the bay, generally at the full and change of the moon, when it is impossible to land or ship

cargo. It is high water, on full and change, at 8^h 30^m; springs rise 6 ft., neaps 4 ft.

Lobo Point, about 10 miles to the northward of Huasco, is rugged, with several small hummocks on it. To the southward of this there are many small sandy beaches, with rocky points between, but a tremendous surf breaks on them, allowing no shelter even for boats. About 11 miles to the northward of Lobo is another rugged point, with several sharp peaks on it, close to the southward of which, in about lat. 28° 9′ S., is a small harbour named *Sarco*.

Herradura de Carrisal.—The Bay of Herradura can hardly be distinguished till quite close. Between the rugged point and Herradura, which is distinguished from other Herraduras by the additional name of *de Carrisal*, there are breakers a quarter of a mile from the shore. Off Herradura Point there is a patch of low rocks, which, in coming from the southward, appears to extend right across the mouth of the bay; but the entrance faces the N.W., and lies between that low patch of rocks and a small islet to the N.E. of it, and there is no danger at half a cable from either of them. The bay curves in about three-quarters of a mile to the eastward of the islet, and is sheltered from both northerly and southerly winds, but with a strong northerly breeze a swell rolls in round the islet; it is rather small for large vessels, and they would not be able to lie at single anchor in the inner part of the cove, but there is room enough to moor across it, about a quarter of a mile above the islet, in 4 fathoms, fine sand. There is a small lagoon, about a mile from this place, in the valley at the head of Carrisal Cove, but it is worse than brackish. This place, however, is closed to vessels, the only port of entry between Huasco and Caldera being Carrisal; any vessel anchoring elsewhere on this part of the coast is liable to be confiscated.

CARRISAL is a small cove, about a mile to the N.E. of Herradura, well sheltered from southerly winds. It has become an important place, as it is near to the copper and silver district of Cerro Blanco, and the company who work these extensive mines commenced, in 1865, to make the railroad which now connects them with Carrisal. This, called the Cerro Blanco Railway, gives direct communication from the coast at Carrisal Bajo to Carrisal Alto, a distance of 70 miles, passing through a desert country, but rich in mineral products. About twenty Englishmen are employed. There is good anchorage, sandy bottom, a reef of rocks acting as a breakwater, and sheltering the shipping at the loading berths. H.M.S. *Reindeer*, in September, 1869, anchored in 11 fathoms, sand and stones, but experienced a very heavy swell.

In 1876, 351 vessels, with a total tonnage of 445,693, visited this place. The harbour is small, and ships have to moor head and stern. The mail steam vessels have a buoy laid down for securing to. Beef may sometimes be had at about 10 cents the pound. Water can be procured of the Railway Company at 4½ dollars per ton, and coal may also be obtained. There is a copper as well

as a silver smelting establishment. This place is connected with the *telegraphic* system.

To the northward of Carrisal the coast is bold and rugged, with outlying rocks a cable's length off most of the points. About 7 miles to the northward there is a high point, with a round hummock on it, and several rocky hummocks a little in-shore. To the northward of this there is a cove sheltered from the southward, where small vessels may anchor, but it is not fit for large vessels; there is another cove similar to it about a mile farther to the northward. A little to the northward of the second cove there is a high rocky point, which is the termination of the high part of the coast. To the northward of the point there is a small port which, from the natives, appears to be called *Matamores;* it is well sheltered from southerly winds, and the landing is good. In the inner part of it a vessel, not drawing more than 10 to 12 ft., might moor, sheltered from northerly winds, in 3 or 4 fathoms, but with a northerly wind there would be a heavy swell.

About 2 miles to the northward of Matamores is the low rocky *Point of Tortoral*, a little to the northward of which is a small deep bay, at the mouth of the valley of *Tortoral Baxo*. About 6 miles to the northward of Tortoral there is a remarkable rocky point, with a detached *white rock* off it, and a hump with a nipple on it a little in-shore.

Pajonal.—About 1½ mile to the northward of this lies the small *Cove of Pajonal*, which, in coming from the southward, may be easily known by the above nipple. The anchorage is better sheltered from southerly winds than any to the southward, except Herradura. There is a dangerous breaker about a quarter of a mile W. by S. of the South extreme point, which only shows when there is much swell. The best anchorage is about halfway up the cove, near the South shore, in 5 fathoms; near the head it is shallow.

Salado Bay.—At 4 miles northward of Pajonal is *Cachos Point*, with an island and several rocks off it; both this island and Square-topped Island, 2 miles to the southward, may be passed within half a mile, but there is no passage inside of them. At Cachos Point the coast turns to the eastward, forming the spacious *Bay of Salado*, and close round the point is the large *Cove of Chasco*, which, at a distance, looks very inviting, but a mile from its head there is only 3 fathoms, with rocks all round. A mile to the N.E. of two patches off the North point there is another recess, which may be called *Middle Bay*, and which is quite clear of danger; in the South corner is a small cove, where there is good anchorage in 7 fathoms, well sheltered from southerly winds, but open to northerly. *Salado Point* is a steep rocky point, with a cluster of steep rocky islets off it. To the northward of this point the coast is rocky and broken, with rocks a short distance from the shore for about 4 miles; then a rugged point, with a high sharp-topped hill a little in-shore, which from the southward, shows a double peak.

Directly to the northward of the latter point there is a deep rocky bay, called

Barranquilla de Copiapó, with a small cove close to the point, where the *Beagle* anchored in 5 fathoms, but only half a cable off shore on either side; it is not fit for any vessel. The bay is partly sheltered from northerly winds, but a northerly swell rolls in, and it does not appear to be a proper place for a vessel to enter. There is no fresh water nearer than the river of Copiapo, which is about 12 miles off. From Barranquilla to *Dallas Point*, 10 miles northward, the coast is rocky and broken, without any place sufficient to shelter the smallest vessels.

Dallas Point is a black rocky point, with a hummock on its extreme, which, coming from the southward, appears to be an island; the land rises to a range of low sandy hills, with rocky summits.

Caxa Chica is a small sharp-topped rock, and is the only one of the reefs that shows above water. The patch near Dallas Point is awash, and the channel between it and the point appears to be wide enough for any vessel, though the reef off the point projects so far as to show in a high sea a breaker above a quarter of a mile out; but at a quarter of a mile farther there is 11 fathoms. When the swell is not high, the breakers off the point would not show; they appeared to be detached from the reef which joins the point.

COPIAPO is a very bad port, now almost deserted; the swell rolls in heavily, and the landing is worse than in any port to the southward; it may easily be known by the Morro, a hill 850 ft. high, 10 miles to the northward, which is very remarkable, nearly level at the top, but near the eastern extreme there are two small hummocks. The East fall is very steep; the end of another range of hills shows to the northward. To the S.W., apparently forming part of the same range, stands another hill, the West side of which forms a steep bluff; in coming from the southward these hills will be seen in clear weather before the land about the port can be made out. The island to the northward of Copiapó Bay, called *Isla Grande*, is very remarkable, having a small nipple on each extremity.

The chief dangers to be avoided in entering the bay of Copiapó are the Caxa Grande and Caxa Chica Shoals, and between these and Dallas Point are several other small but dangerous patches of rock, on one of which the *Anacachi*, a Chilian brig, was wrecked. It lies about half a mile N.W. ½ W. from the Caxa Chica, and carries only 10 ft. at low water. *Caxa Grande*, the northernmost of the two first mentioned, is a bed of rocks under water, about three-quarters of a mile long and one-third of a mile broad, and lying nearly in a North and South direction; its situation is apparent from the heavy breakers on it, whenever a swell sets into the bay. *Caxa Chica* is a small rocky shoal, having in its centre one large rock always above water; it lies South of Caxa Grande, with a passage between them of nearly a mile in breadth, though appearing much less, from the rollers which extend sometimes across it on the Caxa Grande side. The passage between Dallas Point and the southern shoals should never be taken.

The obvious and best passage is that northward of Caxa Grande; and to avoid those rocks, when coming from the southward, bring Isla Grande to bear N.E., and steer for it on that bearing till the northern end of the sandstone rocks, to the northward of the ruins of the town of Copiapó, bears at least E. by S.; then haul in for that mark. Coming from the northward, vessels will most probably have to work in; in which case the shore may be approached to half a mile, and Isla Grande to within that distance, and when approaching Caxa Grande, stand no nearer to it, or any of the shoals, than to bring the western extreme of Isla Grande to bear N.N.W. or the bluff part of Dallas Point S.S.E.

When the Morro de Copiapó, which is so high as to be seen 30 or 35 miles in clear weather, is open of Isla Grande, you are well to the westward of all the dangers off Copiapó.

As above stated, the old town on the bay of Copiapó has been deserted. When the port of La Caldera was established in 1850-51, the government gave sites for buildings in the new town to the householders in the old one, so that they soon commenced to remove to the new port.

Medio Point, on the main to the northward of the Isla Grande is very rocky. On the S.W. point there are two rugged hummocks, and several rocks and islets close to the shore, but no danger outside of them. From this for 5 miles to Morro Point the shore is steep and cliffy, with remarkable patches of white rock on the cliffs to the South of the point, which is steep, with rugged lumps on its summit. The *Morro* rises suddenly a little in-shore.

Port Yngles.—On rounding Morro Point a deep bay opens to the S.E.; there are several small rocky patches in it, and at the North end of the long sandy beach there is a piece of rocky coast, off the North extreme point of which there is a small island. The entrance to *Port Yngles* is to the northward of this point, round the peninsula of *Caldereta*, about a cable's length off which there is a rock awash at high water, but it always shows; after passing this rock the land is steep-to, and may be approached to a cable's length. The harbour inside forms several coves, in the first of which, on the starboard hand going in, there is anchorage for small vessels, but the bottom is stony and bad. There is a low island to the S.E. of this cove, to the eastward of which is the best anchorage with southerly winds. The bay in the N.E. corner is well sheltered from northerly winds, and no sea could ever get up in it, but the landing is not good. The N.E. cove is by far the best in the harbour, but it has no fresh water. The South cove is too shoal for any vessel to go higher up than abreast of the projecting rocky point on the East shore. In the entrance there is 18 fathoms close to the shore on both sides.

PORT CALDERA, close to the northward of Port Yngles, is a fine bay, pretty well sheltered, but more open than Port Yngles. There is water near the beach on the East side, but it is very salt. The land is entirely covered with loose sand, except a few rocks on the points; the bottom of the bay is

low, but the hills rise a little inland, and the ranges become higher as they recede from the coast. The first hill to the eastward is a very remarkable sharp-topped hill, the sides of which are covered with sand, with two low paps to the eastward of it.

A Lighthouse, 43 ft. high, stands on the West entrance point of the port. It is a square wooden tower, painted white, showing a *fixed bright* light, with a *flash* every 1½ minute, at 121 ft. above the sea, and visible 15 miles.

Chango Rock, a pinnacle rock with 3½ fathoms on it at low water, lies about 4½ cables W. ½ N. from Point Francisco, at the North side of entrance to Port Caldera, with the signal station bearing S. ⅜ E., and the lighthouse S.W. by S. *Pulpo Rock*, another pinnacle rock, with 4¼ fathoms on it, lies 1 mile N. ⅝ W from Chango Rock, and 8½ cables W. ¼ S. from Negro Point. Another sunken rock, with 3¾ fathoms on it, lies 1 mile from the coast, and 4¾ miles N. ½ E. from Caldera lighthouse. The sea breaks on these rocks in heavy weather.

The town of Caldera is entirely of recent date. When the American engineers landed here in 1850, the only inhabitants were the myriads of fleas which lived in the sand, and the flies which infested the air. Without a blade of vegetation, without water, a desert of sand through which here and there some blackened rocks protruded, the prospect of the success of a town would have appeared hopeless enough, but the mining riches of the interior required a port in such a position to enable them to be worked successfully. It is the principal port of Atacama, and has a population of about 2,500 inhabitants. There is a *telegraph* station here.

It is to the energy of Mr. W. Wheelwright, F.R.G.S., that the establishment of Caldera is owing. He had previously founded the line of steam-vessels which have so greatly changed the relations of these South American ports to the rest of the world, and seeing that the ores and metals from the vicinity of Copiapó could not be made available, he, in 1849, proposed the railroad from that town to the Pacific, which is now in operation. It was commenced, as above stated, in 1850, and completed in July, 1851. It is 50½ miles long, terminating at an elevation of 1,327 ft. above the sea. In 1854 the extension from Copiapo to Pabellon, 25 miles, commenced; and a further line to Chañarcillo, 26½ miles, and reaches an elevation of 4,470 ft. above the sea. From this it is extended to Los Lores about 18 miles from Pabellon and to San Antonio, 20½ miles, completed in February, 1867. These railroads have proved to be profitable investments, and an extension to the rich copper mining district of Cerro Blanco was proposed in 1865, and is now completed. There is a project on foot for extending this line across the Andes, thus connecting Chile with the Argentine Republic.

The treasures of copper thus brought within reach, and the then unexpected richness of the silver mines of Tres Puntas having been realized, Caldera has flourished and risen in a most extraordinary degree, but, of course, has been

liable to fluctuations. The silver ore is brought down on the backs of mules, and the copper by the railroad. There are large smelting, refining, and amalgamation works for both metals at this port, but one of the larger smelting establishments was destroyed by an earthquake in 1859. The railroad is under excellent management.

In 1879, 329 vessels entered at Caldera, the total tonnage being 345,923, of which 255 vessels, 298,873 tons, were British, mostly P.S.N. Company's boats. The imports, in 1879, through Valparaiso, were valued at 2,224,433 dollars, and from the other Chilian ports and abroad 1,355,311 dollars, making a total of 3,579,744 dollars. The mineral exports for the same year amounted in value to 2,915,634 dollars, of which bar silver represented 1,684,642, and copper 633,891 dollars. Coals are largely imported both from England and Chilian mines. The P.S.N. Company have a depôt here.

The town arose with great rapidity, is well laid out, and has some large and handsome houses and buildings, though, of course, others are not of this character. There is no hospital here, but a good one is established at Copiapo, 50 miles by railway, where sick seamen and other patients are admitted free of charge. The distance is a great inconvenience. The chief drawback was the entire absence of water, a privation overcome by the distilling apparatus, which is even used for water required for the locomotives.

A fine mole, 740 ft. long, is run out from some rocks at the S.E. angle of the bay, into water deep enough for several ships of 2,000 tons to lie against, to load and discharge, and the railway is continued down to the pier-head. There is 20 ft. water at its outer end, and about 18 ft. at the sides near the end. The two outer mooring buoys are used by the P.S.N. Company's vessels; the two inner ones are used for mooring head and stern. Boats should be cautioned of a rock with little water over it near the steps. A *light* is shown at the pier-head, on the night of the steam packet's arrival, to enable her to haul alongside for coaling.

Provisions, such as fresh beef, &c., can be soon procured by means of the railroad. There are five smelting establishments here, the glare from which shows far to seaward.

They have sometimes strong northers here, which throw a good deal of sea into the South corner of the bay; but in the N.E. corner, which is called the Calderillo, it is always smooth. There are fish to be got in the bay, but only with a net. Near the outer points of these two ports rock fish are to be caught, but there is always a heavy swell in such places.

A sailing vessel approaching with little wind should be cautious, as both swell and current have a tendency to set her on shore.

CABEZA DE VACA is a remarkable point, about 12 miles to the northward of Caldera; it has two small hummocks near its extreme, inside of which the land is nearly level for some distance, and then rises to several low hills, which form the extremity of a long range. The coast between Caldera and

the Cabeza forms several small bays, with rocky points between them, off all of which there are rocks at a short distance. There is no danger within a quarter of a mile of the Cabeza. To the northward of it there is a small rocky bay called *Tortoralillo.*

To the northward of this the coast is steep and rocky for 3 or 4 miles, with a high range of hills running close to the shore; then, a small cove called *Obispito*, with a white rock on its South point; and to the northward of this the land is very low and rocky, with breakers about a quarter of a mile from the shore. The best anchorage appears to be in the N.E. corner of Obispito Cove, 2 cables off shore, in 9 fathoms, sand; the house bearing East, or E. by S. Being quite open to the S.W., a heavy sea sets in with the ordinary coast wind, making it bad for boats.

Obispo.—About 2 miles northward of Obispito is a point with a small white islet off it; to the northward of which the coast trends to the eastward, and forms the small cove of *Obispo*, not fit for any vessel. There is a very high sand-hill there, with a stony summit.

Flamenco.—At 7 miles northward of Obispo is the fine bay of *Flamenco;* it is a very good port, well sheltered from southerly winds, and better from the northward, as the point projects far enough to prevent a heavy sea getting up. The landing is good in the S.E. corner of the bay. Flamenco may be known by the white mark on Patch Point. At 10 miles North of Flamenco is *Las Animas*, a rocky bay, and 4 miles N.E. of it is the Bay of Chañeral.

Las Animas has no place fit even for a boat to land; the whole bay is rocky, with a few little patches of sand, and a heavy surf always breaking on the shore. The North point of this bay is low; but a little in-shore there is a high range of hills, the outside of which is very steep; and to the northward of this point there is a small rocky bay, which did not, however, appear to be a fit place for vessels, and the landing was bad.

CHANERAL DE LAS ANIMAS, to the northward of Las Animas, is a much deeper bay; its South side is rocky, with small coves, but the landing appeared to be bad; the East and North shores are low and sandy, and a heavy surf was breaking on the beach. Two sunken rocks are reported to lie in a N.W. by W. $\frac{1}{2}$ W. direction from Bryson Point, on the South side of the bay, at the distances of about $1\frac{3}{4}$ and $2\frac{3}{4}$ cables—the outer rock has about 14 ft. over it at low water; the inner, about 8 ft. Vessels should not round Bryson Point at a less distance than half a mile. The North point of Chañeral Bay is low and rocky, with a high range a little in-shore. It was visited by Dr. Philippi, in December, 1853, who then described it as consisting of about twenty habitations, with 120 to 150 inhabitants. It now contains 3,200 inhabitants. A little to the northward is the *Cachinal de la Costa*, in a narrow ravine, covered with vegetation. All over Chañeral Bay the depth is about 10 fathoms, and shoal water extends some distance to seaward. Vessels may,

therefore, under most circumstances stand into the bay with a certainty of finding an anchorage in easy depth.

A short distance North of Las Animas is a clay coloured, granite point, around which there is a deep cove. About half a mile N.E. of this point, is another named Piedra Blanca, 4 cables N.E. of which is a black rugged point named Piedra Negro; halfway between these points, and at 2 cables from the shore, is the best anchorage, off the loading place, in 7 fathoms, black sand. A dangerous rock with 8 ft. on it at low water lies two-thirds of a cable outside the outermost rock above water, off Piedra Negro. Ships in this bay should not lie with less than 45 fathoms of cable out, as rollers frequently set in.—*Capt. J. Gale*, of the *Florence Nightingale*.

Chañeral, next to Caldera, from which it is distant 45 miles, is the most important port in the northern province of Chile. It owes its rise to the discovery of some rich copper lodes in the neighbourhood, and a large number of mines are now being worked; there are two smelting establishments in the town. Provisions are plentiful, but water is not to be found in the neighbourhood; that used by the residents is condensed sea water, and sold at about 15 cents for an aroba of 8 gallons. Besides copper, some silver mines are being worked at La Florida, 30 miles from Chañeral, and immense deposits of borate of lime have been discovered 120 miles from the port, at a height of 11,000 ft. above the sea. In 1873, 400 vessels visited the port, of which number 269 were British. In 1876, 367 vessels entered, with a total tonnage of 332,267. This port is in communication with the *telegraphic* system.

Railway.—For many years after the first opening of the mines in 1864 the produce was brought to the port in carts drawn by mules. In the year 1871 a railway was made through one of the valleys leading to the principal mines for a distance of 16 miles to Las Animas, and a branch line extending in another direction for a distance of 22 miles to Salado. From these main lines various branches diverge, to accommodate the mines that may be on the way.

The company purpose extending the line from Salado to a place called Pueblo Hundido, a distance of 18 miles, by which it is anticipated that an important mineral district will be opened up. At Pueblo Hundido, water can be obtained suitable for engine and lavatory purposes.

It is considered an easy matter, as far as engineering difficulties are concerned, to extend this railway from Pueblo Hundido to the Argentine system of railway, and thus connect the South Atlantic and South Pacific trades.

Pan de Azucar (*Sugar-loaf Island*).—Nearly 9 miles to the northward of the Bay of Chañeral de las Animas stands Sugar-loaf Island, 600 ft. high, about half a mile from the shore. In coming from the southward there is a similarly shaped hill on the main, a little to the southward of the island, for which it may be mistaken; but the island is not so high, and the summit is sharper. Between Sugar-loaf Island and Chañeral the coast is rocky, and affords no shelter; but there is a small bay to the southward of the island

which affords some shelter from northerly winds, though with southerly winds it would be exposed, and the landing is very bad. In the middle of the passage, between the island and the main, there is 5 fathoms in the shallowest part; the water in its northern end is smooth, and a vessel might anchor off the point of the island, sheltered from southerly winds, in 6 or 7 fathoms; but outside of 8 fathoms it deepens suddenly to 13 and 20 fathoms about half a mile from the island. There is a small bay on the main to the northward of the channel, where a vessel might apparently be sheltered from southerly winds. There is a smelting establishment at Pan de Azucar.

Ballena Point.—About 19 miles to the northward of Sugar-loaf Island there is a projecting point, with some small rocky islets off it, which was supposed to be Ballena Point, from the description given at Port Caldera. Between the point and Sugar-loaf Island the coast falls back a little, and is rocky, with a high range of hills running close to the shore. At 4 miles to the northward of Ballena Point there is a small bay, with a rocky islet about half a mile off its South point; the top of the islet is white, and answers the description given of a port called *Ballenita*, but it is not worthy of the name of a port; it is very rocky, with two or three small patches of sandy beach on which a heavy sea was breaking. Inland eastward of it are the mines of Paposo. At 5 miles to the northward of this is *Lavata Bay*, the South point of which has several low rugged prongs from it, and in-shore the hills rise very steeply. There is a small cove, with excellent landing, directly behind the South point; and there was a still better looking port inside.

At 3 miles to the northward of Lavata there is a point which, till close, appears to be an island, but it is joined to the shore by a low shingle spit; and several rocky islets, that lie scattered off the point, are named the *Tortolas*.

Port San Pedro.—Nearly 3½ miles to the northward of these islets is the *Point of San Pedro*, very rugged, and with a high round hummock a little way in-shore. To the eastward of this point there is a deep bay.

Ysla Blanca Bay is very rocky, and does not afford good anchorage; several rocks lie off San Pedro Point, and inside of it there is a reef projecting half a mile from the shore. In the bottom of the bay there are several small white islets, and two or three small sandy coves, none of which are large enough to afford shelter for a vessel.

TALTAL.—Ysla Blanca Bay is bounded to the northward by *Taltal Point*, and hereabout must lie the Agua del Clerigo, a watering place, 1,400 ft. above the sea, at the foot of a mountain; there are some copper mines here, and there is a smelting establishment at Taltal, but the principal industry consists in the preparation and shipment of nitrate of soda, vast fields of which were discovered in the interior in 1872, and commenced to be worked in 1877, when a rush took place, and Taltal has now a population of upwards of 8,000 in-

habitants. The deposits lie about 70 miles from the coast, and a railway is constructing to Refresco de Cachuyal, a distance of about 50 miles, to bring the nitrate down to the coast.

Immediately to the eastward of Taltal Point is the bay, 1½ mile across, and three-quarters of a mile deep, named Port Taltal; Hueso Parado, its eastern extreme, bearing from Taltal Point, its western limit, N.E. by E. ½ E. Rocks extend 3 cables north-westward from Taltal Point, with 9 fathoms close to them. The port affords secure anchorage, sheltered from the prevailing wind, in 5 to 10 fathoms, from 2 to 3 cables off the beach, in the South part abreast the houses. During winter, water may be procured from a stream that discharges itself just southward of a point near the middle of the port. The steamers call here, and it is proposed to build a mole.

Hueso Parado, to the northward of Taltal, is so called from the rib of a whale being placed there to mark the former boundary. About 3 miles from Taltal Point there is a white islet, with some rugged hummocks upon it; and a little way in-shore there is a hill of much lighter colour than any in the neighbourhood. At about 7 miles northward of Taltal Point is *Puerto Oliva.*

Tides.—The only place at which the time of high water was satisfactorily determined on this part of the coast was at Huasco, where it is $8^h\ 30^m$ on full and change; the rise 4 ft. at neap tides, and at springs about 2 ft. more. From the swell on all this coast it is very difficult to get the time of high water at all near the truth; the rise and fall appeared to be 5 or 6 ft. in all parts of it.

At SAN PEDRO POINT, or rather at *Taltal Point*, near Hueso Parado, the coast of Bolivia was formerly supposed to commence; and from thence it sweeps round the *Bay of Nuestra Senora* to *Grande Point*, a distance of 17 miles. This point, when seen from the S.W., appears high and rounded, terminating in a low, rugged spit, with several hummocks on it, and surrounded by rocks and breakers to the distance of a quarter of a mile. At 9½ miles N. by W. ½ W. from it, lies *Rincon Point*, off which is a large white rock, and between these two points, in latitude 25° 2′ S., stands the village of Paposo.

Paposo is a miserable place. When Dr. Philippi visited it, in 1854, it had only one habitation and a chapel, then closed. In 1834 it contained about 200 inhabitants under an *Alcalde;* the huts were scattered, and difficult to distinguish, from their being the same colour as the hills behind them. It now contains about 450 inhabitants. Vessels touch here occasionally for dried fish and copper ore; the former plentiful, but the latter scarce. The mines lie in a S.E. direction, 20 or 25 miles distant, but till late years were very little worked. The water was brought from wells 2 miles off, but owing to the swell which constantly sets in on the coast, is difficult to embark. Vessels bound for this place should run in on the parallel of 25° S., and when at the distance of 6 or 8 miles, the white rock off Rincon Point will appear, and

shortly after the low white head of Paposo. The course should be immediately shaped for the latter; for, with that bearing S.S.E., distant half a mile, they should anchor in from 14 to 20 fathoms, sand and broken shells. In 1876, 40 vessels, with a total tonnage of 14,624, called here.

Plata Point.—At 23 miles N.N.W. from Grande Point is Plata Point, similar to it in every respect, and terminating in a low spit, off which lie several small rocks, forming a bay on the northern side, with from 17 to 7 fathoms water, rocky, uneven ground.

From this point to Jara Head, which lies N. $\frac{3}{4}$ W., 52 miles, the coast runs in nearly a direct line; a steep, rocky shore, surmounted with hills, from 2,000 to 2,500 ft. high, the numerous intervening points affording shelter for the trading boats of the coast.

Colorado Creek, 4 miles to the northward of Plata Point, is about three-quarters of a cable in extent, and affords good anchorage for small vessels in 3 fathoms, sandy bottom, in the centre of the creek; large vessels can anchor in 10 fathoms, sandy bottom, about 2 or 3 cables N. by E. of the creek, but only partially protected from the S.W. swell.

Nearly 1 mile to the northward of Colorado Creek is *Buitre Point*, about half a mile to the northward of which lies *Buitre Rock*, with 1 fathom on its shoalest part, and steep-to; midway between the rock and the mainland there is 10 to 12 fathoms, rocky bottom. The sea breaks heavily on Buitre Rock.

Remienda Creek, about 17 miles to the northward of Buitre Point, is protected from the southward by a low peninsula, half a mile in diameter. Rocks above water extend $1\frac{1}{4}$ cable in a northerly direction from the North side of the peninsula, having near their extremity a rock with 2 ft. water, on which the sea frequently breaks. Kelp extends about 1 cable from the eastern shore of the creek. The best anchorage is in 8 or 9 fathoms, fine sand, with the extremity of the rocks extending from the peninsula, bearing S.W. by W. $\frac{3}{4}$ W., distant about 2 cables, the depths decreasing gradually to the S.E. part of the creek. At the head of the creek there is a good landing-place on the sandy beach. Remienda would be an important place for loading copper and saltpetre, which abound in the neighbouring districts; but neither wood nor water can be obtained.—*Noticias Hidrograficas*, 1877.

El Cobre Bay, a place of export for copper, situated 29 miles North of Plata Point before described, or about midway between Plata Point and Jara Head, is preferable to many of the small ports of Chile, affording shelter from the prevalent southerly winds. The port is formed by a low sandy point, having a remarkable lump about half a mile from its extremity; on the point are some rocky knolls, and it terminates in a cluster of black rocks with breakers 1 cable beyond them. Approaching El Cobre Bay, the shore should be passed at 6 miles distance; a zigzag road on the hill immediately over the port is a good mark. At 2 miles North of the port are two white-topped islets, and just North of them is a large black point, with a patch of brown

sand to the northward of it. The sandy point forming the port, is also unlike any point near it.

A sailing vessel can load copper from the balsas, with the point bearing S.W. in 14 fathoms, black sand, about 2½ cables off the beach from which the copper is shipped. A stream anchor should be laid out astern to keep the ship's head on to the westerly swell; or for dispatch, a berth may be had nearer the shore, in 7 fathoms; but Landing Point should not in either case be brought to the southward of S. by E. ¼ E. No fresh water is procurable.

Agua Salada Creek, about 4 miles to the northward of El Cobre Bay, may be recognized by a large yellow patch on the side of the mountains N.E. of the creek. Anchorage may be obtained in 12 fathoms, sand and stones, but landing is difficult. *Agua Dulce Creek*, 4 miles to the northward of Agua Salada Creek, affords but indifferent shelter, with deep water, over stone, sand, and shells; the mountains rise abruptly from its rocky shores, to a height of 2,000 ft., having on its North side a detached peak about 3,000 ft. high. The best anchorage is in 19 to 20 fathoms, with the southern white rock a little open of the coast; small vessels may anchor in 13 fathoms nearer the shore. Landing is difficult.

About 9 miles northward of Agua Dulce, and in lat. 23° 58′ 12″ S., is a white pyramid *beacon*, erected on a rock 65 ft. high, near the shore, to mark the northern boundary of Chile as determined by the Chilian and Bolivian Governments in 1874, but since the war the Chilian boundary is now placed at Mexillones, in lat. 23° S.

JARA HEAD, 6 miles northward of the beacon, and in lat. 23° 53′ S., is a steep rock, with a rounded summit, and has on its northern side a snug cove for small craft, visited occasionally by sealing vessels, who leave their boats to seal in the vicinity. Water is left with them, and for fuel they use kelp, which grows there in great quantity. *Mount Jaron*, 3,990 ft. high, is 4 miles eastward of Jara Head.

PORT ANTOFAGASTA, used as a place of export for nitrate since March, 1870, as also for silver from the Caracoles mines, 120 miles to the N.E., lies between Mount Moreno and Jara Head, about 6 miles to the southward of Chimba Bay. The custom-house is in lat. 23° 38′ 35″ S., long. 70° 22′ 19″ W., according to the Chilian survey. In 1882, 54,823 tons of nitrate, 1,936,872 oz. of silver, and 54 tons of iodine were exported; borax and copper ore are also being exported. The only direct imports from abroad are coal and coke, amounting to 26,209 tons in 1882, for the use of the railway and smelting works. There is a *telegraph* station here.

A large white anchor has been painted on the ridge at the back of the town, which, brought to bear from East to E. by N., will lead to the best anchorage, about 6 cables from the shore, in from 15 to 20 fathoms, on a bottom of stiff blue mud, covered with coarse sand and shells, and forming good holding ground. The anchorage is unsheltered, and exposed to the heavy S.W. swell,

almost invariably experienced on this part of the coast. Neither the swell nor the wind, however, have been experienced of sufficient strength to cause anxiety respecting the safety of vessels at anchor. Vessels moor here with two anchors to the S.W. and one astern; they are loaded and discharged by means of lighters.

Light.—A *fixed red* light, elevated 30 ft., and visible 3 miles, is shown between W.S.W. and N.N.W. (90°) from the small tower of the harbour buildings; it marks the fairway of the roadstead, and is usually shown from sunset to midnight, but till sunrise when steamers are expected. It is intended to establish a better light.

Antofagasta should be approached with great caution, on account of the detached rocks off the port; the reefs extend 3 cables from the shore, forming an inner harbour or creek, in which small vessels load, but it is not considered safe on account of the heavy swell on the reefs, and should only be used in case of emergency. A heavy and dangerous sea at times breaks across its entrance, where the depth is from 9 to 18 ft. A *red buoy* is moored off the westernmost part of the reefs.

The only fresh *water* to be obtained is condensed and sold at 5 dollars per ton; fresh beef is about 25 cents the lb., and vegetables are scarce. The population, about 4,500, are partly dependent for their supplies on the coasting steam-vessels, which touch at Antofagasta twice a week. Large works have been erected here for extracting the silver from the ore obtained from the Caracoles mines in the South of Bolivia. A railway, 80 miles in length, extends from Antofagasta to Las Salinas, in the desert of Atacama, whence the nitrate is brought down to the coast.

Chimba Bay, on the East side of Moreno Bay, and about 6 miles to the northward of Antofagasta, appears to be a much better anchorage than Antofagasta, capable of affording shelter to a number of vessels, and one in which they could load and discharge in any weather. No fresh water is procurable.

Moreno Bay.—Nearly 4 miles N. ½ E. from Jara Head, the large Bay of Moreno, or *La Playa Brava*, commences, the intermediate land being high and rocky, with a black rock lying off it; and N.W. by N. ½ N. 22 miles from the head, the S.W. point of Moreno Peninsula, sloping gradually from the summit of *Mount Moreno*, terminates in two nipples from whence its name of *Tetas Point*.

Mount Moreno, formerly called *Monte Jorge*, is the most conspicuous object on this part of the coast; its summit is 4,160 ft. above the level of the sea, inclined on its southern side, but to the northward ending abruptly over the barren plain from which it rises. It is of a light brown (*moreno*) colour, without the slightest sign of vegetation, and split by a deep ravine on its western side.

Constitucion Cove, immediately under Mount Moreno, is a small but snug anchorage, formed by the mainland on one side, and by Forsyth Island on the

other. Here a vessel might haul in to the land, and careen, without being exposed to the heavy rolling swell which sets into most of the ports on this coast. The landing is excellent. Neither wood nor water are to be found in this neighbourhood, therefore provision must be made accordingly. The best anchorage is off a sandy spit at the N.E. end of the island, in 6 fathoms, muddy bottom; but it would be advisable to moor securely, as the sea breeze is sometimes very strong. Further out the holding ground is bad; and when running in, the island or weather side should not be hugged too closely, as a number of sunken rocks lie off the low cliffy points, some only buoyed by kelp. A mid-channel course would be the best, provided the wind allows a vessel to reach the anchorage before mentioned.

Esmeralda Rock, discovered by the Chilian corvette of that name, has only 9 ft. on it, and the marks for it are—the Lagartos Bank, E. by N. ¾ N., distant 1¾ mile; Mount Mexillones N. by E.; and Mount Moreno S.E. ½ E. The depth was 7½ fathoms at 30 yards outside it.

At 12 miles N. by W. from Constitucion Cove, *Mount Jorgino*, a steep bluff, terminates the range of table-land which runs in a line from Mount Moreno; on the northern side of this headland lies the *Bay of Herradura de Mexillones*, a narrow inlet, running to the eastward, but without any shelter.

Leading Bluff.—At 9 miles North from thence, *Low Point* is surrounded with sunken rocks; and 5 miles N.E. by N. of it is *Leading Bluff*, a very remarkable headland, which, with the hill of Mexillones, a few miles farther South, is an excellent guide for the port of Cobija. The bluff about 1,000 ft. high, and facing the North, is entirely covered with *guano*, which gives it the appearance of a chalky cliff. There is an islet about half a mile to the N.W. of the bluff, and attached to it by a reef; at three-quarters of a mile N.W. by N. ¼ N. from this islet is *Abtao Rock*, having 8 ft. on it, with Angamos Point bearing E.S.E., and Low Point S.S.W. Two other rocks with 23 to 33 ft. on them lie between Abtao Rock and the shore.

Mount Mexillones is 2,650 ft. high; it has the appearance of a cone with the top cut off, and stands conspicuously above the surrounding heights.* In clear weather this is undoubtedly the better of the two marks; but as the tops of the hills on the coast of Bolivia are frequently covered with heavy clouds, Leading Bluff is a surer mark, for it cannot be mistaken; for, besides its chalky appearance, it is the northern extremity of the peninsula, and the land falls back many miles to the eastward of it.

MEXILLONES BAY.—Round Leading Bluff is the spacious Bay of Mexillones, 8 miles across, but of little use, as neither wood nor water is to be obtained. The shore is steep-to; but there is anchorage on the western side, 2 miles inside the bluff, and a cable's length off a sandy spit, in 7 fathoms,

* In 1862, some large deposits of *guano* were discovered around the base of **Mount Mexillones**, and several ship-loads were sent to Europe.

sandy bottom; at the distance of 3 cables there is 30 fathoms. A decree of April, 1872, opened a port here, and a *telegraph* station has been established. The town of *San Luciano* has about 500 inhabitants. Vessels should round Leading Bluff at a distance of at least 1½ mile to avoid the dangers, Abtao Rock being neither marked by seaweed nor by a breaking sea.

The boundary between Chile and Bolivia, according to the latest information, is in lat. 23° S., near Mexillones Bay, Mount Mexillones being considered in Chile.

CHAPTER VI.

THE COASTS OF BOLIVIA AND PERU, FROM MEXILLONES TO THE RIVER TUMBEZ.

The coast described in this chapter, was, during the Spanish domination in South America, that of Upper and Lower Peru; but when these states threw off the yoke in 1824, they became separate republics, the former receiving, in 1825, the name of Bolivia, from the Liberator, General Bolivar; and, like many other republics, has suffered much external disorganization, especially since the war with Spain in 1866-7.* As before stated, the result of the war with Chile may cause alterations in its boundaries.

The sea coast of Bolivia now extends from Mexillones to the River Loa, in lat. 21½° S., but the coast is a desert, and the possession of it is but of little importance.

The Republic of Bolivia contains a population of the Spanish and Indian races estimated to number about 2,500,000 in 1883; it has about 200 miles of railway completed, and 300 miles of telegraphs. The value of its trade, principally of minerals, nitrate, alpaca and other wools, furs, &c., amounts to about £3,200,000 annually. The capital was Chuquisaca, but has since been placed at Sucre, population about 25,000, and the only port of importance is Cobija.

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* Peru was formerly the chief seat of Indian civilization in South America. The empire of the Yncas included not only Peru, but extended South into Bolivia, Chile, and the Argentine Republic; and on the North it included Quito, now Ecuador. One of the marvels of this ancient state was the perfection to which they brought their roadways, or rather pathways, as they possessed no horses, llamas being the only beasts of burden. Paved roads were carried along the coast deserts, and connected the mountainous regions, or *sierra*, with the coast and also with the *montana*, or region eastward of the Andes. This, crossing the Andes range by pathways in the time of the Yncas, was as wonderful as the present construction of railways in a country possessing greater engineering difficulties than any other region in the world.—*Vide* Mr. C. R. Markham's paper "On the geographical position of the tribes which formed the empire of the Yncas," in the "Journal of the Royal Geographical Society," vol. xli., 1871, page 281.

A new outlet for its resources has been made in the railway, recently constructed, from Port Mollendo to Puño, on the western shore of Lake Titicaca. Steamers are established on the lake, which is elevated upwards of 12,000 ft. above the level of the sea.

The Republic of Peru was estimated to contain, by the census of 1876, 2,699,945 inhabitants, ethnologically the same as Bolivia. This country has made marvellous progress during recent years, owing to its mineral and other resources, now brought to the ports on the newly constructed railways. The war with Chile has, however, brought trade nearly to a standstill.

Speaking of the progress of the commerce of Peru, in 1874, Señor Don Pedro Galvez says:—"Thirty years ago, two steamers of 800 tons made monthly voyages along the Pacific coast, whereas now there is a fleet of over seventy steamers, some of which are 3,000 or 4,000 tons, making daily voyages on the coast, and bringing all those ports into constant communication with each other. The communications by the Isthmus of Panama being insufficient, other lines of steamers have been established, viâ Magalhaens Strait, which more directly connect the coast of the Pacific with the rest of the world. Telegraphs have made progress corresponding to navigation and railways."

The Railways projected by the Peruvian Government, some completed, have a combined length of 1,281 miles, and will cost, if carried out, a sum of £25,000,000. Including private lines, the length will be 2,030 miles. Of this distance, about 1,000 miles had been completed at the beginning of the year 1878. The lines of railway that are now actually open, as well as those in progress, are from the port of Ylo to Moquegua; from the port of Mollendo, by Arequipa, to Puño on the shores of Lake Titicaca; from Pisco to Yca; from Callao to San Mateo (on the way to Oroya); from Lima to Ancon and Chancay; from Chimbote to Taquilpon; from Pacasmayo to La Viña (on the way to Caxamarca); from Salaverry to Trujillo; and from Paita to Piura. The lines will be further described with each of the ports to which they run.

Guano, or *huano*, a most important export of Peru, was first introduced into England by M. Barhoillet and Mr. Bland, of the firm of Myers, Bland and Co., of Valparaiso, who sent several cargoes in 1839—40, but had great difficulty in introducing it to agriculturists. Its value soon became apparent; when these gentlemen, in connection with another English firm, obtained an exclusive privilege of shipping it from the Peruvian coasts for a term of years. The Ichaboe, or African *guano*, was, as is well known, introduced through the instigation of the late Capt. Andrew Livingston, of Liverpool, a gentleman well known in the nautical world. The first cargo sent to England from this coast was from Paquiqui in the *Charles Eyres*. In 1869, 574,790 tons were exported; in 1877, 310,042 tons. The stock at the Chincha Islands, originally about 10,000,000 tons has been nearly exhausted, but new supplies have been

discovered and examined at Huanillos, Pabellon de Pica, &c., as hereafter described.

Besides the guano and valuable metals, especially silver, which are procured from Peru, there is another branch of commerce of more recent date, that of the saline deposits of nitrate of soda,* and still more lately of borate of lime, which owes its existence to the rainless climate. This has allowed these deposits to remain on the surface without being dissolved, a fact to which the excellence of the guano deposit is also owing. Wool, cotton, and sugar are also somewhat largely exported.

The Desert of Atacama forms the coast provinces which connect Chile, Bolivia, and Peru, and extends from Copiapo to beyond the Loa. It is a very peculiar rainless region, in this part covered with a dark brown or black moveable sand, absolutely arid and uninhabitable. In other parts it consists of enormous piles of stones, gravel, and angular stones, so sharp that the Chango guanaco hunters have to put hide shoes on their dogs' feet. There are no stationary inhabitants, and the only things to be found are the guanaco, vicuña, &c., and a few birds. To its geographical position it owes these singular attributes. Lying under the Tropic of Capricorn, it is subject to a very long continuance of a vertical sun. From its being to leeward of the Andes, it is screened from the easterly wind which would bring some moisture, but the prevalent S.E. wind, passing over the arid plains of the Argentine States, loses much of its vapour, which is nearly all deposited on the East side of the snowy peaks of the Andes, and reaches this region a dry southerly wind.

The *prevailing winds* on the shores of Peru blow from S.S.E. to S.W.; seldom stronger than a fresh breeze, and not often on certain parts of the coast more than sufficient to enable shipping to make a passage from one port to another.

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* *The nitrate* is chiefly obtained from the Tarapaca district, reached by railway from Iquique. Here the area covered by the deposits is estimated at 150 square miles. The mineral called *caliche*, which appears like half formed sand-stone, is found at from 1 to 10 yards below the surface, and in layers from a few inches to 2 or 3 yards in thickness. It is disengaged from its bed by blasting, and then boiled or steamed to extract the nitrate, which is afterwards crystallized by evaporation. The caliche yields about 50 per cent. of nitrate, 35 to 40 per cent. of common salt, and 10 to 15 per cent. of insoluble matter, containing sulphur. For further particulars of this industry, see a paper in the Society of Arts Journal on "The Saltpetre deposits of Peru," by George FitzRoy Cole, C.E., vol. xxiii., 1875, p. 875; a paper by J. Harding, Esq., in the "Journal of the Royal Geographical Society," 1877, p. 250; and the book "Peru in the Guano Age," by Mr. A. J. Duffield, 1877.

The exportation of this article from the ports of the province of Tarapaca is increasing every year. In 1830 the quantity exported was 18,700 *quintals* (a *quintal* = 100 lbs.); in 1840 it was 227,362 *quintals*; in 1850, 511,845; in 1860, 1,370,248; in 1870, 2,943,413; in 1873, 5,768,741; and the whole quantity exported from 1830 to 1873 was 50,173,729 *quintals*. Since then the quantity exported has varied from 321,000 tons in 1875, to 144,000 tons in 1879, the total export from 1830 to 1879 amounting to 3,825,000 tons.

This is especially the case in the district between Cobija and Callao. Sometimes during the summer, for three or four successive days, there is not a breath of wind; the sky beautifully clear, and with a nearly vertical sun.

On the days that the sea breeze sets in, it generally commences about 10 in the morning; light and variable at first, but gradually increasing till 1 or 2 in the afternoon; from that time a steady breeze prevails till near sunset, when it begins to die away; and soon after the sun is down all is dead calm. About 8 or 9 in the evening light winds begin to come off the land, and continue till sunrise, when it again falls calm until the sea breeze after mid-day.

During the winter (from April to August) light northerly winds may be expected frequently, and are generally accompanied by thick fogs, or dark lowering weather; but this seldom occurs in the summer months, although even the tops of the hills are frequently enveloped in mist.

The great feature of this country is, as farther South, the great chain of the Andes. "The two great mountain chains of the western regions of South America are not sufficiently distinguished by their respective names; the terms Andes and Cordillera being used indiscriminately for either of them, which confusion of names is done even in Peru. Nevertheless, a strict distinction ought to be observed:—the western chain should properly be called the Cordillera, and the eastern chain the Andes. They stand, in respect to height, in an inverse relation to each other; that is to say, the greater the elevation of the Cordillera, the more considerable is the depression of the Andes. The medium height of the Cordillera, which is of the most importance in the present work, is in South Peru, about 15,000 ft. above the sea, but with particular points here and there which rise to a greater height. The Andes are here about 17,000 ft. In Central Peru the Cordillera is the highest.

"The Cordillera is more wild and rugged, its ridge broader, and its summit less pyramidical than those of the Andes, which terminate in slender, sharp peaks, like needles. The Cordillera descends in terraces to the level heights, and is, moreover, the ridge of division, or watershed, between the waters which flow to the Atlantic and those which reach the Pacific. All the waters of the eastern declivity of the Cordillera work their way through the Andes to the Atlantic, while there is not a single instance of the Cordillera being intersected by a river; a fact more remarkable, because in Bolivia and southern Peru it is the lower chain."*

Some of the more prominent peaks visible fron sea are noticed hereafter.

The rivers which flow into the Pacific are chiefly used for irrigation; none of them are navigable, except the Rio Piura, which is so for some months, as far as the town of Piura.

On the coast of Peru each bay or landing place has its own peculiarly con-

* "Travels in Peru during the Years 1838—42," by Dr. J. J. Von Tschudi, translated by Thomasina Ross, 1847.

structed vessel, adapted for the surf it has to go through. Thus, at Malabrigo, the fishermen have what they call "caballitos," bunches of reeds tied together, and turned up at the bow like a Chilian balsa, but much higher. These are so light, that they are thrown from the top of the surf to the beach, when the people jump off, and carry them to their huts. But the most important and best known of these contrivances is the *balsa* (raft, Spanish), which is formed of seal skins sewn together and inflated; two of these bags, about 8 ft. in length, are fastened together at one end for a prow, and completed by small pieces of wood covered with matting sewn across. It is paddled with a piece of wood with a blade at each end. It is difficult at times to launch, but will land three passengers, besides the steersman, at any time, with great facility.

In Lima the seasons are usually distinguished as spring, summer, autumn, and winter, but the usual division by the aborigines, into wet and dry, are the true distinctions.

"In May the mornings become damp and hazy; and, from the beginning to the latter end of June, more or less drizzly. In October, again, the rains, which, even in the months of July and August, are seldom heavier than a Scotch mist, cannot be said to be altogether over, as the days are still more or less wet, or occasionally there may be seen to fall a light passing shower; the evenings and mornings being damp and foggy.

"In November and December, when the dry season may be reckoned to have set in, the weather, except for an interval at noon, is for the most part cool, bracing, and delightful; and April, too, is in this respect an agreeable month; at the latter end of which, the natives of the capital, being so exceedingly sensitive as to feel a difference of only two or three degrees between the temperature of two succeeding days like an entire change of climate, are admonished, by a disagreeable change in their sensations, to protect themselves by warm apparel against the chills arising from an occasional N.W., or from the influence of the common S.W. wind.

"Throughout summer the wind blows almost uniformly, and in gentle breezes, from the South; but the prevailing wind for nine months in the year is the S.W., which, as it mingles with the warmer air along the arid coasts of Peru, tends to moderate the temperature of the atmosphere, and to produce the fog and '*garua*,' or thick Scotch mists. During the dry seasons on the coasts, the rains are experienced in the interior of the country and lofty range of the high table lands; especially in the months of January, February, and March, when the rain that falls inland is often very heavy, and, on the most elevated regions, it is not unfrequently alternated with snow and hail. Thus, the dry season of the coast is the wet in the sierra, or mountain land, and *vice versâ*; and by merely ascending higher to the sierra, or descending close to the sea, without any appreciable shifting of latitude, the favoured Peruvians may enjoy, by the short migration of a few leagues, a perpetual summer, or an endless winter; if

that, indeed, should be called winter which is the season of the natural growth and herbage."—*Smith's Peru.*

Earthquakes are more common, perhaps, in Peru, than in any other country. Every traveller tells us of his experience of some shocks of greater or less violence. To enumerate them, therefore, would be a very prolix work. These convulsions have effected very evident changes in some parts of the sea-coasts and harbours, and some of their traces have been much speculated on. For an account of the principal earthquakes and tidal waves which have caused so much destruction on this coast, including the disastrous one of May 9th, 1877, see the "Geographical Magazine," August, 1877, pp. 206—209.

In a subsequent part of this volume we shall give some lengthened observations on the *winds* and seasons of the coasts. The reader is, therefore, referred to them for more full information on these heads.

The survey of this coast was made under Admiral FitzRoy's orders by Mr. Usborne, R.N., whose directions are given in the subsequent pages, as they will be found in Adm. FitzRoy's Appendix. To these have been added some observations made by M. Lartigue, in the French frigate *La Clorinde*, Capt. Le Baron Mackau, in 1822-23; other later information, especially from the work of Capt. Aurelio Garcia y Garcia, of the Peruvian Navy, will be found as quoted.

The COAST.—Gualaguala Cove is in lat. 22° 57′ S. and N.E. ¾ E. 12 miles from Leading Bluff. It has good anchorage in 7 fathoms, sand and broken shells, where vessels load with copper ore, which is brought from the establishment by a tramway to a mole, and is loaded into the boats by a shoot, under which they can be safely moored.

COBIJA, or LA MAR.—From Gualaguala the coast runs nearly North, without anything worthy of remark, as far as the Bay of Cobija, or Puerto La Mar, which lies N. by E. 30 miles from Leading Bluff. A railroad is talked of from Cobija to Potosi, 540 miles in length. The present means of transport is by mules. Potosi, the highest city in the world, 13,350 ft. above the sea, is reached in 14 days, a distance of 540 miles.

Scattered for about half a mile along a beach at the base of a lofty range of hills, part of its houses of stone, and others of planks, the town presents a neat and tidy appearance. Cobija has a custom-house, a church, and about 1,500 inhabitants, exclusive of the persons employed in the copper mines in the neighbourhood. For their protection a fort stands on a rocky point on the South shore of the open bay. There is no vegetation, and all garden stuff brought is caught up with the greatest avidity. Cattle are driven from the pampas of Buenos Ayres.

There are valuable copper mines in the vicinity, but the products were shipped principally from *Gatico* or *Catica*, 6 miles, and *Algodon*, 28 miles to the northward. They are chiefly owned by English companies, who import almost every necessary.

This being the only port of entry belonging to Bolivia, all vessels must come here first for a custom-house licence, if they are bound for any other place. All towns in the southern part of the republic obtain their supplies through this place. The exports consist of bar-tin, copper barrilla, regulus, and ore, guano, and silver coin. The value of exports from Bolivian ports in 1871 was £269,352, and imports £24,512. In 1881 the exports to Great Britain amounted to £327,781, and the imports from it to £118,283.

There is good anchorage off Cobija in 8 or 9 fathoms, sand and broken shells, over a rocky bottom. Mail and coasting steam-vessels belonging to the P.S.N. Company call here, and they have a buoy laid down in 10 fathoms. H.M.S. *Ringdove*, in 1869, anchored in 18 fathoms, with the church bearing S.E., and Rocky Point N.N.E.

Supplies.—Good water is scarce, as rain never falls here, and that from the wells is brackish. There is, however, a constant supply of distilled water. Fresh meat can always be procured; fruit and vegetables are brought from Chile and Peru. A mole has been constructed, which renders landing tolerably easy.

If coming from the southward towards this bay, after having passed Leading Bluff (which should always be made), see p. 198, it would be advisable to shape a course so as to close the land 6 or 8 miles southward of the port, and then coast along until two white-topped islets, off *False Point*, are seen; at 1¼ mile to the northward of them is the port. On the slope of Cobija Point there is a *white stone*, which shows very plainly in relief against the black rocks in the background: a flag is usually hoisted at the fort when a vessel appears in the offing, which is also a good guide. In going in there is no danger; the point is steep-to, and may be rounded at a cable's length. In the bay there are a number of straggling rocks, but they are all well pointed out by kelp. Owing to the heavy swell, it requires some skill to wind the boats in through the narrow channel formed by rocks on each side up to the mole. The long kelp is also dangerous if a boat should be swamped, as was the case in 1854, when five men belonging to the French brig of war *Obligado* were drowned here.

It requires care, however, to make this place; the hills rise directly from the coast, and form an almost unbroken ridge of from 2,000 to 3,000 ft. high, having no sufficiently marked feature to point out the position of the town at their base; the white-topped rock would be a good mark were there not now a precisely similar rock some miles to the northward. The church at the back of the town forms also a good mark. Another mark is a kind of gully, or indentation in the hills, a little to the northward of the town, and another is the road winding up the valley from the port, but neither of them is easily distinguished.

COPPER COVE, or Gatico Bay, at 2 miles N.N.E. of Cobija, is a convenient place for taking in the ore, there being anchorage a short distance from the shore. The ore is placed in bags on balsas, and conveyed to boats moored

near the shore; in this way 50 tons per day can easily be put on board. All vessels coming here to load are obliged to call at Cobija for a permit. The coast is easy of access and free from danger within a short distance of the beach. The best anchorage is with Cobija Point just touching the extreme of Rocky Point (the West point of the cove), bearing S.S.W., and the pier S.E. ½ E., in 18 to 15 fathoms (not less than 15 fathoms), fine dark sand.

There are no good leading marks for making Copper Cove, the hills being constantly covered with mist, halfway from summit to base. The white church at Cobija is, however, a conspicuous object, and in clear weather will be a good guide. If bound here for Cobija, stand to the northward along the coast, about 4 cables distant, until the pier opens, then round Rocky Point at 1½ cable, or as convenient, and anchor as above.

If bound from the northward, after making Cobija church, steer for it on a S.E. by S. bearing, until the ranchos on the South side of Copper Cove are visible, then bring the northernmost detached rancho on with the pier-head, E. by S. ¾ S., and stand in, anchoring as above. The ranchos and pier will not be seen until within 3 or 4 miles of the land.

A heavy swell sets into this cove and with the constant light S.W. winds and calms, renders it difficult for heavily laden sailing vessels to get out. They should never attempt it without the aid of boats to tow, for before they could claw off the land under sail alone, the swell very probably would set them ashore.

Huanillo Cove.—From Copper Cove the coast takes about a N. ½ W. direction, generally shallow sandy bays with rocky points, and land from 2,000 to 3,000 ft. high close to the coast; but no place fit for shipping until reaching Algodon Bay, 28 miles from Cobija. At Huanillo Cove, 6 miles N. by W. from Cobija, there is good anchorage in 16 fathoms, sand and broken shells, a short distance from the mole. The mining establishment and smelting furnaces are near the shore, and the metals are conveyed over a tramway along an excellent mole to a shoot, under which boats can lie with perfect safety at all times. A large distilling apparatus supplies the establishment and the persons engaged in the mines with water.

Punta Blanca, 24 miles northward of Cobija, has on its North side a cove in which vessels occasionally load with copper ore.

ALGODON BAY is small, and the water deep; the *Beagle* anchored a quarter of a mile from the shore in 11 fathoms, sand and broken shells, over a rocky bottom. It may be distinguished by a gully leading down to it, and by that of Mamilla to the northward, which has two paps 4,020 ft. high over its North side. For a vessel coming from the southward, the best mark is a broad light stratum on the high land about a mile to the southward of Algodon Point; there is also a white islet off this point.

There are three places in this bay from whence ores are shipped, Bella Vista, Tocopilla, and Duendas, and around are valuable mines in all directions.

Tocopilla, which stands in the southern angle of the bay, contains about 800 inhabitants, and is becoming a place of some importance for the export of copper. The principal mines and the smelting furnaces belong to an English company, who have erected a mole, along which is a tramway to facilitate the embarkation of metals, and to convey coal and merchandize to their establishment. Fresh meat can be had at a moderate price, and though there is a spring of good water at the gully of *Mamilla*, 7 miles to the northward, that generally used is distilled; three large distilling apparatuses supplying the wants of the place. Four coasting steamers belonging to the P.S.N. Company call here monthly. The spring at Mamilla is 1½ mile from the beach.

Duendas is in the northern part of Algodon Bay, about 1½ mile northward of Tocopilla. Capt. J. Gales, who visited this place in the ship *Florence Nightingale*, August, 1860, describes it as an extensive smelting establishment; the copper mines not being more than 1 to 2 miles distant from the works. A mole is run out into 12 ft. at low water, and although a heavy swell sets in at the full and change of the moon, and occasionally at other times, landing and discharging cargo can generally be effected. The *Florence Nightingale* remained there through the two worst months of the year, and lost on an average one day every week through the swell.

There are two dangerous rocks in the anchorage, the *Duendas* with 15 ft. water, and the *Nightingale* with 6 ft. water; the latter is marked by a large buoy, on which a flag will be hoisted when a vessel is entering the port. Duendas Rock lies W.N.W., one-third of a mile from the mole. The mole is sheltered by a large white rock, off the extremity of which is a smaller one just awash; the *Florence Nightingale* anchored just to the southward of the latter rock.

Point San Francisco, or Paquiqui.—About 9 miles North from Algodon Bay there is a projecting cape, called in the Spanish chart San Francisco, but known more generally by the name of *Paquiqui* or *Paquica;* on its North side, and near its extremity, there is a large bed of *guano*, which has been worked for many years. The anchorage is not good, and a heavy surf breaks on the rocks, so that the landing is dangerous.

At 16 miles N. ¼ W. from Cape Paquiqui lies *Arena Point*, a low sandy point, with rocky outline; between the two is a small fishing village, near a remarkable hummock. Anchorage may be obtained under Point Arena, in 10 fathoms, fine sandy bottom. From Arena Point to the Bolivian boundary at the Loa Gully, the distance is 12 miles to N. ¾ E.

THE COAST OF PERU.

The shores of this remarkable country were surveyed by the ever to be lamented Admiral Robert FitzRoy in the years 1834-36, and the charts drawn entirely by his own hand appeared in 1840. In the appendix to the interesting account of the *Beagle's* expedition, the sailing directions, which elucidate these charts were given, and have been hitherto the only good nautical account we have.

But at the period of the *Beagle's* survey, there was no suspicion of the abundance of the wonderful natural and mineral riches, which have since been discovered and added so immensely to the wealth of this otherwise barren region. On this account the original survey is, in many respects, incomplete and insufficient for present requirements; insignificant places have sprung into great importance, and many nameless localities have become the centres of much trade. From time to time the remarks of various British officers and consuls have improved our knowledge, but the chief addition was made in 1866, the "Peruvian Coast Pilot," by Capt. Aurelio Garcia y Garcia, of the Peruvian navy, which is based on Admiral FitzRoy's directions, and gives, in addition, accounts of all places of more recent interest; a later edition of this work has been published.

RIVER LOA.—At 12 miles N. ¾ E. from Arena Point are the *Gully* and *River of Loa*, in lat. 21° 28′ S., which forms the boundary line between Bolivia and Peru. It is the principal river on this part of the coast; but its water is extremely bad, in consequence of running through a bed of saltpetre, as well as from the hills surrounding containing copper ore; but, bad as it is, the people residing on its banks have no other. At *Chacansi*, in the interior, the water is tolerably good. In the summer season it is about 15 ft. broad and a foot deep, and runs with considerable strength to within a quarter of a mile of the sea, where it spreads and flows over, or filters through the beach, but does not make even a swatchway, or throw up any banks. A chapel on the North bank, half a mile from the sea, is the only remains of a once populous village. People from the interior visit it occasionally for *guano*, which is in abundance.

The best distinguishing mark for the Loa is the gully through which it runs; and that may be easily known from its being in the deepest part of the bay formed by Arena Point on the South, and Lobo Point on the North; as well as from the hills on the South side being nearly level, while those on the North are much higher and irregular. There is good anchorage in *Loa Cove*, but rather exposed to the sea breeze, with the chapel bearing North, half a mile from the shore, in from 8 to 12 fathoms, muddy bottom. Landing may be effected under *Chileno Point*, 3 miles southward.

False Chipana Point, the S.W. point of Chipana Bay, is 5 miles N.W. by N. of Loa Cove, the land between being high. *Chipana Point* is half a mile to the N.E. of the false point, and off it are several rocks; one of these is higher than the others, and half a mile beyond them to the North. Keep outside of all these rocks.

CHIPANA BAY.—The best anchorage here is in the Bay of Chipana, 6 miles N.N.W. from Loa River. After making the land in the latitude of the Loa, a large white double patch may be seen on the side of a hill near the beach, and a similar one a little to the northward; on discovering these marks (which are visible 10 or 12 miles), a course should be shaped directly for the southern point, where lies the anchorage in 7 fathoms, sand and broken shells, sheltered by low level ground. No danger need be feared in anchoring; for, though the land is low, it may be approached within half a mile, in from 10 to 6 fathoms. The anchorage inside the long kelp-covered reef might perhaps be preferred; but the landing is not so good there. Near the tail of False Chipana Point is a sheltered cove, where boats may land, but a heavy swell sets in at full and change.

HUANILLOS POINT, 7 miles to the northward of Chipana Bay, takes its name from the guano* deposit found on it. It is the second point North of the low promontory forming Chipana Bay, and may be recognised at a distance of 20 miles by a conspicuous broad white patch facing the sea. The point is steep-to, and with a commanding breeze may be rounded by a sailing vessel at the distance of a quarter of a mile.

The anchorage is just inside and North of Huanillos Point, in 14 to 16 fathoms, rocky bottom, half a mile from the shore; as heavy rollers set into the

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* The Guano Deposits recently opened up were thoroughly examined during the year 1874, by order of the Peruvian Government. The quality of the guano was also tested, and reported to be powdery, very dry, and superior to Chincha, owing to the quantity of ammonia it contains. The first important deposit, commencing from the South, is at Chipana, in lat. 21° 23′ S., long. 70° 6′ 50″ W., on the North end of the table land which extends from the River Loa. Next comes the deposit at Huanillos, an elevated cliff, in lat. 21° 15′ S., estimated to contain 900,000 tons. Pabellon de Pica, 1,000 ft. high, has its sides formed of guano deposits, in lat. 20° 58′ S., estimated at 4,500,000 tons. The three newly-discovered deposits of Huanillos, Punta de Lobos, and Pabellon de Pica, together, are estimated to contain 7,400,000 tons of guano, of good quality, or three-quarters as much as was found on the Chincha group, and valued at £7 10s. a ton, worth £55,500,000. Since this, other extensive deposits have been discovered to the North of Lima at Lobos de Tierra, Chimbote, &c., but estimates of the quantity are not to be relied on, some authorities estimating it to be more, and others considerably less. In 1877 the total quantity exported amounted to 310,042 tons. For further particulars see the book mentioned in the note on p. 202.

A curious feature is the scarcity of birds hereabouts. An old resident told Captain Cookson, R.N., who recently was here surveying, that about the year 1850 a plague visited the birds, and carried them off in immense numbers. Previous to this they were very plentiful.

cove occasionally, a nearer berth is not recommended. Vessels bound into the cove should endeavour to make the land to the southward of the point. The landing-place is at the North angle of the point, but the landing is bad in consequence of some rocks on the beach in the vicinity.

Lobos or Blanca Point is bold, 3,090 ft. high, and may be known by the two white *Pajaros Islets*, about 20 ft. high, situated 1½ mile South of Lobos Point, and half a mile from the shore, and by the bell-shaped peak of Mount Carrasco, 9 miles to the northward of the point. Pajaros Islets and Lobos Point are steep-to, and may be passed at a convenient distance; soundings will not be obtained until near the anchorage, which is midway between some rocks a few feet above water, about three-quarters of a mile North of Lobos Point, and the point, in 18 or 20 fathoms, rock and shells, half a mile from the shore; in this berth, Pajaros Islets will be shut in by Lobos Point. This anchorage is considered better than that of Huanillos, but is not so capacious. Landing is comparatively good at Lobos Point.

Midway between Huanillos and Lobos Points a long reef extends out 2 miles from a point South of the small fishing village of *Chomache*. On the outer part of the reef a cluster of rocks show themselves a few feet above water, therefore vessels should not approach this part of the coast too closely at night. In a bight North of Chomache Point, where there are some guano patches, vessels may anchor near the land in from 9 to 13 fathoms.

Water.—The people of Chomache get their water from the River Loa, on *balsas*, the passage requiring four days.

PABELLON DE PICA, situated directly under Carrasco Peak, is 1,040 ft. high, covered with guano, and may be known by its remarkable bell-tent shaped appearance and strong contrast with the barren, sunburnt brown of the surrounding hills. A bay, 1 mile across, is formed by Pabellon de Pica and a hill, 50 ft. high, to the northward, also covered with guano. East, a little southerly, a few miles in-shore, is the bell-shaped mountain named Carrasco, 5,520 ft. high.

There is anchorage in the bay formed by Pabellon de Pica and the hill, 50 ft. high, in 12 to 18 fathoms, rock, with patches of sand and shells, but it is advisable not to anchor in less than 14 fathoms on account of the heavy rollers that occasionally set into the bay. There is also anchorage in 14 fathoms, half a mile W.S.W. of the landing place, where several vessels may ride. The only landing place is on a smooth sandy beach, sheltered by four small islets and several rocks, half a mile North of the hill, 50 ft. high, where lighters may go in, be moored in safety, and load easily. Only national vessels are allowed to come here for guano.

Patache Point.—At 14 miles N.N.W. from Lobos Point is the low, rugged, projecting point of Patache, with an islet a quarter of a mile in the offing all clear outside, and anchorage in from 7 to 10 fathoms close in-shore to the northward of it.

The Coast from Patache Point to Gruesa Point, N. ¾ W., 28 miles, is low and rocky, the termination of a long range of table-land, called the *Heights of Oyarvide*, or the *Barrancas*, from its cliffy appearance. It has numerous rocks and shoals off it, and should not be approached within 3 miles, for the frequent calms and heavy swell peculiar to this coast render it unsafe for nearer approach. Inland of these heights, 28 miles to the northward of Mount Carrasco, is Mount Oyarvide, 5,800 ft. high.

PATILLOS ISLETS, 4½ miles northward of Patache Point, consist of three small and very white rocks close to the land. To the leeward of them is *Patillos Cove*, in which the depth is 7 to 10 fathoms at one-third of a mile from the coast. The islets are conspicuous, and on the shore are the large white storehouses for the nitrate of soda shipped here. A railway was in process of formation to the nitrate works.

At 2½ miles northward of Patillos Islets are *Yapes Islets*, high, and projecting from *Yapes Point*. To the North of the point is a small cove, at which nitrate of soda is shipped. The anchorage is in from 7 to 10 fathoms, 2 cables to leeward of the islets. In coming to the cove you must pass very close to the islets to avoid several rocks which are about one-third of a mile North of the cove. *Lena Cove* is in the same bend of the coast, and *Caramucho Cove* is 1⅓ mile North of Yapes. It is unsheltered, and has bad anchorage.

Chucumata Cove is 11 miles North of Patillos, and S.W. by W. from Mount Oyarvide. It is slightly sheltered from the South by a small point, and affords anchorage in 7 to 10 fathoms. *Ligate Cove* is 1 mile North of it, and has no shelter or interest.

Gruesa Point is the extremity of *Mount Tarapacá*, the termination seaward of the Heights of Oyarvide. The mount slopes to the southward, and the point is low, but cliffy, with three white patches on its northern side. Off it are several rocks always visible, which extend above half a mile from the shore. Foul ground also extends off it, and the pilots warn sailing vessels not to approach within 5 miles of the point. *Chiquinate* or *Cheuranatta Bay* is 4¼ miles north-eastward of Gruesa Point.

There is so much sameness in the aspect of the land on this part of the coast, the whole presenting the appearance of a rugged wall rising from the sea, that, unless a vessel is close in-shore, it is difficult to distinguish the various points, especially in the morning, when the sun is over the land.

Molle Cove lies 5 miles southward of Iquique, and here nitrate of soda was once shipped. It was at one time sent to the beach by a "flying bridge," two parallel wire ropes, 3,736 ft. long, from the mountain 1,800 ft. high, down which a car containing the nitrate was sent, but it failed from the breaking of the rope. From its proximity, also, to the silver mines of Huantajaya, some of the ores were prepared here. There is no water: the cliffs are formed of thick layers of recent shells.—*Bollaert.*

Molle Cove is easily recognized: towards its head, and on the hills at the

back of it, the zig-zag road leading down the heights can be quite clearly distinguished at a great distance. There is a wharf alongside of which vessels of 600 tons could lie. The place is quite without resources; no vessels visit it now, and the wharves are falling into decay. Anchorage can be had near the shore in from 4 to 9 fathoms. *Miami Rock*, with 16 ft. water on it, and marked by kelp, lies 1 cable N.W. ¼ N. from the S.W. point of the cove.

Between Molle Cove and *Cabancha Point*, 3 miles northward, the coast is a low sandy beach, interrupted by a rocky patch about a quarter of a mile wide. Farther inland there is a ridge of yellow sand, 886 ft. high. Cabancha Point is low and rocky; the cove to the North of it offers some shelter from S.W. winds, and has several landing places.

IQUIQUE "stands on a little plain of land at the foot of a great wall of rocks, 2,000 ft. in height, which line forms the coast. The whole is utterly desert. A light shower of rain falls only once in very many years; and hence the ravines are filled with detritus, and the mountain sides covered by hills of fine white sand, even 1,000 ft. high. The inhabitants live like persons on board a ship, every necessary coming from a distance.—*Mr. Darwin*, 1835.

Although thus situated, surrounded by a desert, it has grown to a place of considerable trade and importance. The growth of the nitrate trade, the exports of which, in the outset, were mainly due to the perseverance of Mr. George Smith, has caused a great increase in the place. In 1830, the amount exported was 18,700 cwt.; in 1858, it was 61,000 tons; in 1872, 180,000 tons; and in 1878, 264,517 tons; the total quantity exported between the years 1830 and 1878 amounting to the enormous sum of about 3,350,000 tons. Originally it was the shipping place for the famous silver mines of Huantajaya and Santa Rosa, the former about 6 miles to the S.E. Iquique has well-built houses and warehouses, being the chief port of Southern Peru, and also for the export of nitrate and borax. It had a population of 11,700 souls in 1879, but in March, 1880, it had dwindled to 5,000, in consequence of the war with Chile. An earthquake occurred here in 1868, destroying property to the value of £1,000,000, comprising the commercial portions of the town, and storehouses. The loss of life amounted to 130 or 150. On May 9th, 1877, an earthquake and a tidal wave caused great destruction here. The town stands on a stratum of broken shells several feet thick, an evidence, among many others, of the upheaval of the coast.

All kinds of provisions are now to be obtained, though at high prices. Abundance of coal for steam vessels can be purchased at a reasonable rate. The water used is condensed by machinery, the price being about 5 dollars a ton.

The railway from Iquique to La Noria, where the nitrate is worked, starts in a northerly direction from the port, making towards the coast cliffs, which it reaches at a distance of 3 miles, and at an elevation of 300 ft.; thence it reverses its direction, and creeps up the hill side on an incline of 3 per cent., un-

til it attains the summit of the coast cliffs at Molle, 1,630 ft. above the sea, and 10 miles from Iquique, thence it is carried inland to Noria.

Two lines of steamers call here. Imports, chiefly barley, coal, and cattle, are carried principally in Chilian vessels. A mole has also been constructed.

Iquique Island is about a mile in length with its reef, and is the burial place of foreigners. It was formerly covered with guano, and is low throughout, but it has (or had) a hummock which rises to 50 ft. It is surrounded by reefs.

LIGHT.—Near the centre of Iquique Island stands a white cylindrical iron column, 72 ft. high, from which is shown a *fixed bright* light, with a *flash* every half minute, elevated 96 ft. above high water, and visible 16 miles.

"The port lies to the North of the island above mentioned which shelters it. It is commodious, spacious, and safe, and embraces an extent of 3 miles. The bottom is of sand and stone, in 5 to 6 fathoms water. It is quite safe with one anchor and two chain shackles. The principal landing place, or that for merchandize, is in front of the wall around the custom-house, in a small creek. To reach this, the boat channel between the coast and the island should be taken, endeavouring to get nearer the latter, until you are in a right line with the custom-house. There are many low rocks off the coast towards the channel, which are apt to be covered at high tide. Care should be taken not to strike against them, especially at night and during a heavy swell, which is of common occurrence from June to August.

"There are several wooden piers owned by private individuals, and these owners allow their use for landing of passengers without any charge. The one belonging to Mr. Smith is to be preferred, as it is outside the channel, North of the town, and for this reason offers many conveniences at night to ships' officers.

"South of the island there is no safe anchorage, not only on account of the many rocks scattered about that part, but because it is unsheltered.

"Ships bound for the port of Iquique should endeavour to make out the coast from the South, not approaching within 4 miles of it until they discover the bay. Then steer towards the island, which can be distinguished at a tolerable distance, and also for the church steeple, or the cemetery dome at the back of the town, and in this mode the port will be made. When near the island it is very common to be perfectly becalmed: in such cases it is well to lower the ship's boats and tow them in, for, if not, one will be sure to find himself at break of day to leeward of the port: thanks to the strong current." —*Capt. Garcia y Garcia, P.N.*

The anchorage is good in 11 fathoms, with Piedras Point bearing N. by W.; the outer point of the island, S.W. by W.; and the church steeple, S. by E. ¼ E. Two wrecks lie about a mile northward of the anchorage.

Vessels have attempted the crooked passage between the island and the main by mistake, and thereby got into danger, from which they were extricated

with some difficulty; it is only fit for boats or very small vessels. *Morro Point*, on its South side, has a tall red iron chimney on it; breakers extend a cable off in heavy weather. Balsas are employed to bring off the cargoes, as is the case in most of the ports on this coast.

Remarkable agitations of the sea, called *Bravezas*, frequently take place at Iquique during the months of May to August; landing is then difficult, as also at spring tides. The best landing place for the town is at the custom-house mole: there is also a good landing place on Colorado Beach, near the southern extremity. In bad weather the best landing is to the northward of Morro Point; the channel is then dangerous, and boats should pass westward of the island, and enter the channel.

Iquique may be recognised from seaward by a dome-shaped mountain, about 3,000 ft. high, situated a little to the southward of the anchorage; this mountain, which can be seen from a distance of 20 or 30 miles, has, just under and a short distance to the northward of it, a zig-zag road, which is visible for 12 miles. Approaching from the northward, the bend of the line of railway upon the mountain is conspicuous; also, a sand-hill with a sharp peak, situated South of the town. A pilot can be got here if required.

Piedras Point bounds the port of Iquique to the northward. It is 912 ft. high, and rocky, and extending 3 cables off it is a cluster of rocks and breakers which give it the name. At 11½ miles North of it is *Colorado Point*, to leeward of which is the unsheltered cove of the same name, whence saltpetre is shipped. The road to the highlands is seen on the hills. *Colalue Islets* lie off the point, and about 1 mile N.W. ¼ N. from them the Peruvian corvette *Union* reported some rocks in 1876.

At 18 miles N. by W. from Piedras Point is the small, low, black *Island of Mexillon*, with some white rocks lying 3½ cables S.W. by W. of it. It may be known by the *Gully of Aurora*, a little to the southward, and a road, apparently well trodden, on the side of the hills leading to the mines.

Mexillon Bay is on the N.E. side of the island. In entering, give the North point of the island, which is black, a berth of at least 1 cable, in from 9 to 11 fathoms, to avoid two sunken rocks, the outer one of which, with 9 ft. on it, lies about two-thirds of a cable N. by W. off the point. The best anchorage is in 10 or 12 fathoms to leeward of an islet in the centre of the cove in front of the huts. It is a narrow and troublesome place, and when more than three or four large vessels are here, it is necessary to clap a spring on the cable. Heavy shipments of nitrate of soda are made from this cove, and large storehouses are erected for it, but the place is destitute of all resources.

Junin Cove, 9 miles North of Mexillon, is slightly protected from the southward by a point, on which there is a jetty for boats. The depth is from 10 to 20 fathoms close in-shore; vessels should always moor head and stern to ride to the constant swell from the southward. The mountain road is a good guide, and there is a tower painted white on the cliffs over the anchorage. Junin Cove

possesses a large establishment for the export of saltpetre. Water for drinking purposes must be obtained from condensers.

Pichalo Point is 15 miles N.W. by N. ½ N. from Mexillon, and projects 2 miles into the sea. It is the most remarkable point on the coast.

BAY of GUAINA-PISAGUA.—In rounding Pichalo Point, avoid a *rock* which lies about half a cable N.N.W. of it; otherwise the point is clear. The Bay of Guaina-Pisagua opens here, and is surrounded by very high hills. In the eastern part, or at the head of the bay, in front of the village, is the anchorage in from 9 to 15 fathoms, near the land, a good berth being with Pisagua Point bearing N. ¾ W. A *sunken rock*, on which the sea does not always break, lies in front of the centre of the village, about a cable's length off shore, which must be avoided. To do this, anchor on the side West of the village until the rock is found.

The bay is liable to very frequent gusts of wind from the hills, sometimes with very great violence, and shifting to different points from one instant to another. For this reason it is necessary in rounding the point to carry but very little sail, the topsails will be sufficient, and the best moorings should be laid out.

The port contains a population of about 1,200 people. Fresh provisions and water are to be procured, although dear, having to be brought from a distance. Next to Iquique, it is the chief place for the export of nitrate of soda; a railway has been constructed, leading to the works at Sal de Obispo. Coal can be had in small quantities, comparatively cheap.

Pisagua River, at 2½ miles North of the village, makes a conspicuous break in the shore; and its water supplies all the neighbouring inhabitants. For a few months during the winter season, when this river attains the greatest strength, it appears to be about 10 ft. in width, but even then has not sufficient force to make an exit for itself into the sea; like the Loa to the South, it merely filters through the beach, or is lost in the parched-up soil around. During nine months of the year no water is found in its bed, though a scanty supply may always be had from the wells dug near it; yet no vessel should trust to renewing her stock at this place, for, besides its unwholesomeness, the difficulty and expense attending embarkation would be great.

Gorda Point.—From Pichalo Point to Gorda Point, 18 miles, the coast is of low broken cliffs, with a few scattered rocks off it, and ranges of high hills near. Gorda Point is a low jutting prong, where a long line of cliff, several hundred feet high, commences, and continues, with only two breaks or interruptions (the *quebradas* of the Spaniards), as far northward as Arica.

These breaks in the cliffs, or gullies, as they are called by the sailors, are remarkable, and very useful in making Arica, from the southward. The first is the *Quebrada de Camarones*, which lies 7 miles North of Gorda Point, and is about a mile in width, lying at right angles to the coast, with a small stream of water running down it, and a quantity of brushwood on its banks;

it forms a slight sandy bay, but not sufficient to shelter a vessel from the heavy swell.

Madrid Point, at 12 miles northward of the above gully, is clear, but has nothing worth mentioning, but *Cape Lobos*, 27 miles North of Camarones, is more remarkable. It projects a short distance from the line of coast, is dark at the base, but has some very clear white patches near the summit. These patches are thin coats of guano.

The *Quebrada of Victor* is the other gully; it lies 29 miles to the northward of Camarones, and 16 miles to the southward of Arica; it is about three-quarters of a mile in width, and from the high bold point Cape Lobos, jutting out to the south-westward, forms a tolerably good anchorage for small vessels. It traverses the country in a similar manner to that of Camarones, and has likewise a small stream passing through, with verdure on its banks.

La Capilla.—The coast still trends to the northward for 11½ miles. The southern part consists of high, bold cliffs, with table land on the top, varying from 2,000 to 4,000 ft. in height. At the distance above mentioned the coast forms a small bight called La Capilla, which is surrounded by lower hills, and not so steep. To the southward some whitish patches and bends are seen, which are slight coverings of guano.

To the northward of this bight the coast is slightly indented, forming the bay called *La Licera*, which has good sandy bottom in from 7 to 11 fathoms, but quite unsheltered, though landing can be effected when the sea is quiet.

Vessels bound to Arica should endeavour to make the gully or ravine of Victor, and when within 10 or 12 miles of it they will see Arica Head, which appears as a steep bluff, with a round hill in-shore, called *Monte Gordo*. Upon nearer approach the *Island of Alacran* will be observed, joined to the head by a reef of rocks. To the northward of this island, and round the head, is the port and town of Arica, which is the seaport of Tacna. Alacran Island is low and uninhabited. It is surrounded by rocks; those to the West and North are farthest off, and reach half a cable's length out. The best landing on the island is from the Morro Channel.

ARICA is built close to the beach, in a small bay formed by a precipitous bluff or morro, 690 ft. high, and a low rocky islet on the right as you enter. The town lies at the northern base of the morro, and has a population of about 5,000 inhabitants. It was completely destroyed by the terrible earthquake and tidal wave of August 13th, 1868, when, besides the loss of property, estimated at £2,500,000, the loss of life amounted to 550. There were six ships at anchor off the town, of these only the crews of two were saved. The tide wave rose 60 ft., and landed the U.S. war vessel *Wateree* 600 yards above high-water mark, and 25 ft. above high-water level. Since this calamity, the town has been slowly recovering; the custom-house was nearly completed in

May, 1874, and the mole re-established. Another tidal wave, on May 9th, 1877, caused great destruction.

A railroad connects Arica with Tacna, a distance of 40 miles, the journey occupying 2½ hours. It has been proposed, and a company formed with a capital of £3,600,000, to extend this line across the Andes to La Paz, in Bolivia, a distance of 108 miles. Should this undertaking be carried out, it will enormously increase the trade of Arica, as the line would pass through the finest mineral districts in Bolivia, the present cost of carriage from which is so heavy as entirely to prohibit the export of any but the richest ores.

Fresh provisions and vegetables, with all kinds of tropical fruit, may be had in abundance, and upon reasonable terms. The water also is good; it comes from the *Azape Valley*, which is seen at the head of and beyond the town. It may be obtained from the small jetty recently erected by the new water company, whose works are close to the railway terminus. Fever and ague are said to be prevalent; this in all probability arises from the decomposing vegetation, and being sheltered from the sea-breeze. The thermometer ranges from 82° Fah. in the summer to 55° in the winter, which is singularly cool for its tropical situation.

The most valuable exports are silver, copper-barrilla, and Peruvian bark; of silver, the value of that exported in 1875, was £334,022; of copper, £176,312. Other exports are tin, hides, skins, wool, cotton, cocoa, coffee, tobacco, &c. In 1875 the value of goods exported was £396,400, and of bullion £456,719. The imports consist principally of foreign goods for home use and transit to Bolivia, and exceed the exports in value.

The port is safe, spacious, and convenient, the depth 5 to 9 fathoms, coarse sandy bottom. It is always most safe with one anchor and 45 fathoms of chain. On the side to leeward the bottom is rocky, and therefore to be avoided. The best and most sheltered anchorage is North of the small island, at from 100 to 150 fathoms. It is advisable to moor by the stern, with the head to sea, if the ship is to remain, as the sea from the S.W. may cause too much motion to be pleasant; this is especially the case from June to August. The wreck of the war vessel *Manco Capac*, lies in 7 fathoms, about 5½ cables N. by E. of the town, and 3¼ cables off shore.

Vessels bound to Arica should make the Gully of Victor, as before described. Leaving for ports to the southward, the offing should not exceed 40 or 50 miles from the coast, as beyond this distance the trade winds will be found, the wind gradually drawing to the eastward, and causing great trouble in making the land again.

THE ANDES.—The Western Cordillera of the Andes between Cobija and Arica attains a very great elevation, and offers several snow-capped peaks well known to navigators.

The most southern group of these peaks consists of four majestic *nevados*, known to the original inhabitants of the neighbouring provinces of the interior

by the names of Gualatieri or Schama, Chungara, Parinacota, and Anaclache. *Gualatieri*, or *Schama*, which Mr. Pentland thinks the most elevated of the four, is in the form of the most regular truncated cone, enveloped to its base in perpetual snow. Masses of ashes and vapour are seen to issue from its summit at intervals, so as to leave no doubt of its being a volcano in activity. Its elevation is estimated at 22,000 ft. North of *Gualatieri* rise two magnificent nevados, which, owing to their similarity of form, and their contiguity to each other, are known to the Creole population by the name of *Melizzos* or *Twins*, whilst they are called *Chungara* and *Parinacota* by the Indian population. The most southern of these nevados forms a very perfect truncated cone, whilst the most northern resembles a dome or bell (campaña). There is little doubt but that both are of igneous origin and that Chungara possesses an active crater at its summit, still in activity. The *Nevado of Anaclache* is certainly less elevated than the three preceding, and, perhaps, does not exceed 18,500 ft. It forms a ragged ridge, in the direction of the Cordillera, of considerable length.

Still further North, several snow-capped peaks rise at the back of Arica. The centre of this group may be fixed where the Gualillas Pass, a col or passage of the western Cordillera, which attains an elevation of 14,830 ft., is crossed by the great commercial road from Arica to La Paz, and the interior of Bolivia. The *Nevado of Chipicani*, which is about the mean elevation of this snow-capped group, is 16,988 ft. high, and consists of a broken down crater, with an active sofatara in its centre.

The COAST.—From Arica the coast takes a sudden turn to the north-westward; as far as the river *Juan de Dios*, or *Juan Diaz*, it is a low sandy beach, with regular soundings on which the swell beats heavily. The *Valley of Chacayuta* adjoins that of Azapa, and extends North of Arica, with a perceptible ascent. From Juan Diaz the coast become gradually more rocky, and increases in height till it reaches the *Point* and *Morro of Sama*, 3,890 ft. high. This is the highest and most conspicuous land near the sea about this part of the coast, and, at a distance, appears from its boldness to project beyond the neighbouring coast line. On its western side there is a cove formed by Sama Point, bearing N.W. by W. 45 miles from Arica Head, where coasting vessels occasionally anchor for *guano;* and there are three or four miserable-looking huts, the residence of those who collect it. It would be quite impossible to land there, except on a balsa, and even then with difficulty. Should a vessel be drifted down there by baffling winds and heavy swell, which has been the case, she should endeavour to pass the head (as a number of rocks surround it) about a mile to the westward; and there anchorage may be obtained in 15 fathoms.

Point Tyke, at 9 miles N.W. by W. ½ W. from Sama Point, is low and rocky, and between these points issues the small *River Cumba*, or *Locumba*, with low cliffs on each side; like most of the rivers on this coast, it has not

strength to make an outlet, but is lost in the shingle beach at the foot of the cliffs; it flows only between February and July, but for the rest of the year it is nearly dry. Regular soundings, which continue gradually increasing as far as Coles Point, may be obtained at the distance of 2 miles, in from 15 to 20 fathoms.

Ite Creek, about 1 mile South of Cumba River, is a landing-place, and may be recognised by the blockhouses, with a road immediately behind them, showing well against the dark coloured hills. A reef of rocks, projecting from the North side, breaks the heavy swell and shelters the passage. During autumn and winter the heavy sea makes it unapproachable. North of the rocks, as far as Cumba River, there is anchorage in 10 fathoms, sand, with Sama Point bearing S.E., and the conspicuous road N. ½ E.

At 30 miles W.N.W. of Sama Point, is *Coles Point;* the shore between is alternately sandy beach, with low cliff, and moderately high table-land a short distance from the coast.

COLES POINT is very remarkable; it is a low sandy spit, running out from an abrupt termination of a line of table-land. Near its extremity there is a cluster of small hummocks; and at a distance it appears like an island. Off the point to the S.W., there is a cluster of rocks or islets, but no hidden dangers; the channel between is 6 fathoms deep, but obstructed by a ledge of 1 to 2½ fathoms. The rebound of the sea beating against both sides of the point causes a ripple, and much froth, which leads one to suspect a reef in the vicinity. Northward of the point foul ground extends some way from the shore, and must be carefully avoided. It was proposed to erect a *light-house* here.

YLO, or ILO.—At 5½ miles N.E. of Coles Point, is the village and roadstead of Ylo. This place, which contained about 300 inhabitants, was entirely destroyed by the earthquake wave in 1868. But little trade is carried on, and that chiefly in olive oil and *guano;* a mine of copper has been discovered, which may add to its importance. The inhabitants have full occupation in collecting the necessaries of life, and do not care, therefore, to trouble themselves about luxuries. Some improvement may take place in the trade of this port now that the railway is completed from here to Moquegua, at the foot of the Andes, which is 63 miles long, and passes through the best wine-producing district in Peru; the population now amounts to about 400. *Water* is scarce, and wood is brought from the interior, so that it is not on any account a suitable place for shipping. The mail steamers call here.

The best anchorage is off the village of *Pacocha* (1½ mile southward of Ylo), in 12 or 13 fathoms, and the best landing is in *Huano Creek;* but bad indeed is the best, and care must be taken lest the boat be swamped, or hurled with violence against the rocks. Pacocha can be easily recognised by the heaps of yellow guano which are always piled up on the beach, and also by the ruined walls of an old warehouse. In going into Ylo, the shore should not be

approached nearer than half a mile (as many sharp rocks and blind breakers exist), until three small rocks, called the Brothers, which are generally visible under the Table End, bear East, when the village of Pacocha may be steered for, and anchorage taken abreast of it, as convenient. These rocks, situated on the shoal which extends N.W. of Table End, are covered at high water; on the extremity of the shoal there is a depth of 9 ft. about 1 mile from the shore. *English Cove* affords the best landing, but boats are forbidden that cove, to prevent the contraband trade carried on there.

The *Cordillera of the Andes*, behind Ylo, has not been very accurately examined, it being frequently clouded prevents observations. It is traversed by a road leading from the railway terminus at Moquegua to the interior of Bolivia, along which the merchandise is carried.

The Coast from Ylo trends to the north-westward, with a cliffy outline, from 200 to 400 ft. in height. At 8½ miles N.W. ½ N. is *Yerba Buena Point*, to the North of which are the gully and cove of the same name. Near the land off the gully, there is tolerable anchorage.

Pacay Point is 13½ miles N.W. from Yerba Buena. It is high and rocky. The cove of the same name is to the North of it, with good anchorage in from 18 to 20 fathoms, stony bottom. The heaps of guano seen on the shore are for country use. There are but a few huts and no resources. To the North of this the coast is free from danger; there are a few islets near it, the most remarkable of which is *Jesus Islet*, about half a mile from the land, and covered with a thin layer of *guano*.

Cocotea Cove, to the North of Jesus Islet, penetrates into the coast with high mountains at its extremities, and a gully at its head. The best anchorage is toward the interior between the Islet of Jesus and the northern coast. The swell is constantly very heavy here. Vessels going there to discharge may shift by warping up into 5 fathoms in front of the huts. It is only visited by small country vessels with guano.

At 12 miles beyond this the *Valley of Tambo*, which is of considerable extent, may be easily distinguished by its fertile appearance, contrasting strongly with the barren and desolate cliffs on either side; those to the eastward maintaining their regularity for several miles, while on the other they are broken, and from the near approach of the hills the aspect is bolder. The valley is the only place hereabouts where large fields are seen under cultivation. The quebrada is very wide near the sea, but becomes narrower farther inland. It supports a considerable population, and abounds with resources.

Mexico Point, off this valley, bears N.W. ½ W., 40 miles from Coles Point, and E. ¾ S., 20 miles from Islay Point; it is low, and covered with brushwood to the water's edge, and projects considerably beyond the general trend of the coast. At the distance of 2 miles to the southward, soundings may be obtained in 10 fathoms, muddy bottom; from that depth, in the same direction, it increases to 20 fathoms; but on each side of the bank there is 50 fathoms.

In clear weather the *Misti* or *Volcano of Arequipa*, 20,200 ft., can be seen at a distance of 100 miles from the coast, through the Quebrada or Valley of Tambo. It is a cone covered with perpetual snow.

Megia or Mejia.—The coast continues high and barren for 7 miles to W.N.W. from the Quebrada of Tambo to a small bight called Megia Cove, where the anchorage is not sheltered in any way. This place was proposed in 1863 as the future port of Arequipa, and the railway, which now starts from Mollendo, was to have been constructed here.

On the mountains towards the interior the railway and road leading to Arequipa can be discerned. It is very distant on the hill running along a gully called *Guerrero*, which is the best mark by which to distinguish Megia Cove or Mollendo.

PORT MOLLENDO is 9 miles W.N.W. of Megia Cove, and 16 miles from Mexico Point. It is the capital of the province, and the terminus of the Puno-Arequipa railway, and from this circumstance has risen from a small fishing village, in 1870, to a place containing, in 1879, about 3,000 inhabitants, while Islay has proportionately declined. It has suffered very much during the war with Chile.

The railway, said to be the longest line South of the equator, and the loftiest and most serpentine in the world, extends 107 miles from Mollendo to Arequipa,* and 218 miles from Arequipa to Puno, a town of 5,000 inhabitants, on the shores of Lake Titicaca. At present these lines do not pay; only one passenger train a day runs between Arequipa and Mollendo, and only two trains a week between Puno and Arequipa. Goods trains are also few in number. The original intention was to attract the trade of Bolivia across Lake Titicaca by steamers to Puno, and thence viâ Arequipa to Mollendo.

Provisions are dear. The custom tariff was about 30 per cent. on the ad valorem of good imported. The trade is nearly all carried on by coasting steamers, 196 of the 208 vessels which called here in 1879, being of that class. Exports chiefly wool and Peruvian bark.

Water is supplied to the port from the river at Arequipa by the longest iron aqueduct in the world. The pipe, 85 miles in length, is laid alongside the railway, starting from an elevation of 7,000 ft.; it crosses the desert between that city and Mollendo, discharging 433,000 gallons in twenty-four hours.

The anchorage is simply an open roadstead without any protection, so that at times when a heavy swell sets in all communication is stopped between the shipping and the shore, but this does not often happen. A berth will be found

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* Arequipa, the second city of Peru, was founded by Pizarro's orders in 1536. It is a tolerably well built and trading town, standing 7,797 ft. above the sea, and a few miles from the volcano of Arequipa, which is 20,200 ft. high. The houses are low and massive, on account of the frequent earthquakes from which it has at all times greatly suffered. Its population is about 40,000.

in from 20 to 24 fathoms, rocky bottom, with the flagstaff bearing N.E. by E., distant three-quarters of a mile. There is generally a current setting to the N.W. at the rate of half a mile an hour in the vicinity of the port, and the wind seldom blows home. A steam-tug can be obtained if necessary.

There are no dangers above a cable from the shore, but the place being without shelter from the constant S.W. swell and strong current, vessels require strong moorings astern. There are two mooring buoys for the convenience of steam-vessels North and South in 20 fathoms, 4 cables from the rocks.

South of the upper buildings, on the cliffs, is an island connected with the shore by the railway embankment, which divides the inner creeks, in the northern of which is a temporary mole inside the small point and detached rocks off shore.

Light.—On a flag-staff erected on the peninsula, a light, 147 ft. above the sea, is (or was) shown, and can be seen at a distance of 3 miles.

Vessels bound for Mollendo should steer for Tambo valley, keeping about 3 miles off shore. Sailing vessels when overtaken by a calm cannot find other anchorage than off Mexico Point, but the anchorage there is bad. Farther North, bottom is only found nearer the coast. Some of the marks hereafter given for making the Port of Islay will be found useful for making this port.

From Mollendo the coast trends westward 5 miles to Islay Point. All this part of the coast is easily recognised; it consists of high barren mountains, sloping towards the sea, and terminating in abrupt nearly perpendicular cliffs. All these mountains are covered by very extensive white patches, some of which are caused by volcanic ashes or whitish earth, deposited by some volcanic eruption in very ancient times.

Islay Point is a dark belt slightly projecting under these white patches, with some rocky islets under it. *St. Malo Rock*, which barely covers, lies about half a mile South of the point. At 2 miles East of the point is Chiguas Creek, where boats can land in fine weather.

Albizuri, or White Islets, three in number, lie north-westward of Islay Point, and mark the entrance to Islay Bay. They are of moderate height, white, and free from danger.

ISLAY, or Yslay, previous to the construction of the railway to Mollendo, was the Port of Arequipa. It is formed by the straggling islets off Islay Point and by Flat Rock Point, which extends to the N.W.; it is capable of containing twenty or twenty-five sail. The town, said to contain only 200 inhabitants in 1874, is perched on the brow of a gradually sloping bluff, without a tree or even a blade of grass to relieve its barren look. It is at the bottom of a little bay formed by the main coast and a cluster of volcanic islets tossed up from ocean's abyss. A bold, precipitous and beachless shore, and a constant swell rolling in renders landing difficult at all times. Here it rarely blows home, and ships can ride in comparative safety. An iron mole much improved the

landing of passengers and goods, but the port is now completely abandoned, Mollendo having taken its place.

The space for anchorage inside the islands is much circumscribed, and the water very deep. The road up the cliffs is so steep that most of the goods landed had to be carried up and down on men's backs, to the plateau at the summit, 300 ft. high, where the custom-house and town were built. The town was supplied with very good water from the hills, the pipes reaching down to the mole.

Islay, while it was the seaport of the second city of Peru, was much frequented, and the following directions will assist in making it. Vessels have frequently been in sight, to the westward of the port, yet from the set of the current—half a knot, and at the full and change often as much as 1 knot, to the westward—have been prevented from anchoring for several days.

Coming from the *southward*, the land should be made abreast of Tambo, and a certainty of that place ascertained, which, according to the state of the weather, may be seen from the distance of 10 to 18 miles; the course should then be shaped toward a gap in the mountain to the westward, with a defined sharp-topped hill in the near range, a short distance from it. Through this gap lies the road which leads to Arequipa, and which winds along the foot of the hill from Islay.

The best marks for making Islay are the white rocks which form the port; those to the northward off Cornejo Point, however, are very similar when first seen, but the dark bay to the northward of that point, and the road to Arequipa, which shows plainly when approaching Islay, will be a sufficient guide to distinguish them. There is also a rather remarkable bell-topped mountain, *Mount Islay*, 3,340 ft. high, to the N.E. of the town, which is useful in making the port when the fog hangs on the low land.

As the coast is approached, the foot of the hills will be seen to be covered with a white powder or ashes. This peculiarity commences a little to the westward of Tambo, and continues as far as Cornejo Point, and when within 10 miles, Islay Point and the Albizuri or White Islets forming the bay will be plainly observed, and should be steered for.

Care must be taken in closing Islay Point, to avoid St. Malo Rock. It is the custom to go to the westward of the White Islands; but with a commanding breeze, it would be better to run between the third outer and next island, which enables a vessel to choose her berth at once; for the wind heads on passing the outer island, and obliges a vessel to bring up and use warps, or endanger her being thrown by the swell too near the main shore. The mark to run between the third and fourth islets, is Flat Rock just open of the point North of the town. Pass close to the rock, or you will get off the bank, and anchor directly the town is well open, in 20 fathoms, with Flat Rock S. by E. and the point North of the town N.E. A hawser is necessary to keep the bow to the swell, to prevent rolling heavily even in the most sheltered part.

Vessels from the eastward should observe the same directions, allowing for the N.W. current of 1 mile an hour.

From the westward, run in on the parallel of 17° 5′, which will lead about 3 miles to the southward of Islay Point; and if the longitude cannot be trusted, Cornejo Point, being the most remarkable land, and easily seen from that parallel, should be recognised in passing. If the weather be clear, the Valley of Quilca may be seen, which is the first green spot West of Tambo. Cornejo Point, however, must be searched for, and, when abreast of it, Islay Point will be seen, topping to the eastward, like two islands, off a sloping point. The sharp bell-topped hill before named in the near range will also be seen, if favourable weather; and shortly after the town will appear like black spots in strong relief against the white ground, when a course may be shaped for the anchorage as before.

On the N.E. side of Islay Pier is a lofty islet, called *La Fuente*, which separates the port from Matarini Cove.

Matarini Cove is at the foot of a quebrada or gully, and is the best anchorage in the bay, but is not suitable for vessels which have to discharge at the pier, on account of its distance from it. In front of it is a sandy beach, and the landing is at the foot of a hill. In the middle of the cove is a rock, free from danger.

Mollendito is 3 miles to N.W., the intervening coast being perpendicular cliffs; the gully has good anchorage for small craft in front of it. A few fishermen live here. *Santa Ana Cove*, 8½ miles farther northward, offers no shelter.

Cornejo Point, of a reddish colour, is 2½ miles beyond, the intervening coast being high, rocky, and covered with white. It lies N.W. by W. ½ W., 14 miles from Islay Point, and is about 200 ft. high, with the appearance of a fort of two tiers of guns, and perfectly white; the adjacent coast to the West is dark, and forms a bay; and on the East there are low black cliffs, with ashes on the top, extending halfway up the hills. Off the West end of the point are three low rocks or farallones, on which the sea always breaks. On one of these the P.S.N. Company's steamer *Peru* struck, and was much damaged. This point has sometimes been mistaken for that of Islay, but by attention this should not occur.

Northward of Cornejo Point the coast retires and forms a shallow bay, in which are three small coves, viz., Noratos, Guata, and Aranta.

Noratos Gully, 1 mile to the northward of Cornejo Point, is fronted by a cove, without convenient anchorage; however, small vessels can moor in 27 fathoms 2 cables from the entrance, and haul to the head of the cove without experiencing the swell, and make repairs in case of need. About 2 or 3 cables from the entrance, H.M.S. *Albatross*, 1876, found a 5½-fathoms rock. There are no resources, but abundance of fish. *Guata Cove*, 3 miles North of Cornejo Point, affords anchorage for small craft; at its head is a well of brackish water.

Aranta Cove, 3 miles N.W. of Guata Cove, may be known by a small white islet to the southward of it. The bottom is stony, in 19 to 21 fathoms, 1½ cable off shore; there is frequently a heavy swell, and no shelter at any time for a large vessel.

QUILCA.—At 13 miles N.W. ¾ W. of Cornejo Point, are the Valley and River of Quilca, off which vessels occasionally anchor, under Seal Rock, lying to the S.E. of Quilca Point. A red buoy marks the best anchorage for steamers. Watering is sometimes attempted, by filling at the river and rafting off, but must always be attended with much difficulty and danger. The valley is about three-quarters of a mile in width, and, differing from the others, which are level, runs down the side of the hill. From the regularity of the cliffs by which it is bounded, it has almost the appearance of a work of art.

When opposite and near to the gully, a small cove will be seen to the North of it, with a narrow entrance, which offers the best anchorage for small vessels in 6 to 9 fathoms, with many facilities for landing. For large ships the best anchorage is South of the cove, between the latter and the mouth of the gully, and when nearly at right-angles with the church door and the small island, or farallon, lying to the South. In front of the valley there is no landing, and sometimes a heavy surf runs into the cove.

Arequipa, the capital of southern Peru, is about 45 miles up the river from Quilca. The city is 7,797 ft. above the sea, and towering over it rise three snow-capped mountains, nearly of equal height, viz., Pichu-Pichu, the volcano of Arequipa, or Guagua-Putina, and Chacani. The first and third of these mountains form two elongated serrated ridges, whilst the second presents a very singular volcanic cone, truncated at its summit, and rising to an elevation of 18,300 ft. above the Pacific. This volcano has a deep crater, from which ashes and vapour are constantly seen to rise. The summits are usually covered with snow, but at times, after very warm summers, it disappears.—*Mr. Pentland.*

Camana' Valley.—At 9½ miles W. by N. of Quilca is *Pano Point*, and 18 miles W. ½ N. from Quilca is the *Valley of Camana';* the coast between is nearly straight, with alternate sandy beach and low broken cliff, the termination of the barren hills immediately above. The valley is from 2 to 3 miles broad (M. Lartigue says 5 or 6 miles) near the sea, and apparently well cultivated. The village stands about a mile from the beach, but, being small and surrounded with thick brushwood, is scarcely perceptible from seaward.

On approaching from the eastward, *Monte Fuerte* or *Camana'*, a remarkable cliff, resembling a fort, will be seen near the sea; this is an excellent guide till the valley becomes open. There is anchorage in 10 or 12 fathoms, muddy bottom, due South, about a mile; but landing would be dangerous. At one time a port was endeavoured to be established, but all landing had to be effected by balsas. An export of olives is carried on. Water from the river is good.

Ocona Valley.—At 23 miles W. by N. ½ N., is the Valley of Ocoña, the next remarkable place; it is smaller and less conspicuous than the former, but similar in other respects. An islet lies at its southern extreme, and several rocks near the end of the cliff, on its eastern side.

M. Lartigue says:—"The Valley of Ocoña is very narrow, but fertile, and you must be very near to distinguish it. In general, vessels ought not to anchor opposite to the Valleys of Camana' and Ocoña, except when the breezes are light, and when there is danger of being carried on to the coast by the swell."

POINT PESCADORES, at 12 miles farther W. by N., is a projecting bluff point, with a cove on its eastern side, surrounded by islets, and at 1 mile S. ⅝ E. from the point lies *Flora Rock*, drying nearly 2 ft. at low water. To the westward of the point there is a bay, but no anchorage; and the coast then runs in a direct line W. ¾ N., 26 miles, as far as *Atico Point*, a rugged peninsula, with a number of irregular hillocks on it, and barely connected with the coast by a sandy isthmus. At a distance it appears like an island, the isthmus not being visible far off.

Atico Road.—There is a tolerable anchorage in Atico Road, in 19 or 20 fathoms, on its western side, and excellent landing in a snug cove at the inner end of the peninsula. By keeping a cable's length off shore, no danger need be feared in running into this road. The *Valley of Atico* lies 4½ miles to the eastward, where there are about thirty houses scattered among trees, which grow to the height of some 20 ft. From this point the coast continues its westerly direction (low and broken cliff, with hills immediately above) to the foot of *Capa Point;* it then forms a curve towards Chala Point; and in these two intervals are several sandy coves, but none serviceable for shipping. *Loboso Point* is 8 miles westward of Atico. It projects but slightly, and its western extremity is formed of black rocks.

Chala Point, 50 miles W. by N. ¾ N. from Atico Point, is a high rocky point, the termination of the *Morro*, or mount of that name. This mount, 3,740 ft. high, shows very prominently, and has several summits. On the East side there is a valley separating it from another but lower mountain, with two remarkable paps, and on the West it slopes suddenly to a sandy plain. The nearest range of hills to the northward are considerably in-shore, making Morro Chala still more conspicuous.

Saguas Creek.—At 30 miles N.W. by W. of Atico Point is the small creek of Saguas, with a depth of 8 to 15 fathoms, 3 cables off shore. There is no shelter from the heavy S.W. swell, which makes landing very frequently impossible. The bed of a dried torrent is seen in the ravine extending from the valley.

Unsafe Cove, about 9 miles to the eastward of Chala Point, is a small cove, with 15 to 20 fathoms, protected by some off-lying rocks, where the P.S.N. Company have established a port of call for their steam vessels, but it is a

difficult place even for a boat to land. The wharf has been destroyed, and no vessel should go within the rocks, as the heavy rollers will sometimes come in without warning, and then it is all broken water. A merchant brig was enticed in by the natives, but was nearly lost before she got out again. Port Chala is the nearest port to the City of Cuzco. Of recent years business has been opened up with the interior. There are several good veins of copper in its vicinity some of which are being worked. The place is destitute of all necessaries, even water.

At 18 miles N.W. by W. $\frac{3}{4}$ W. from Chala Point is *Chavini* or *Puquija Point*, which appears like a rock on the beach; between these points there is a sandy beach, with little green hillocks and sand-hills; and two rivulets, running from the valleys of Atequipa and Lomas. These valleys are seen at a considerable distance.

Tanaca Creek, 7 miles northward of Chala Point, is entirely without shelter, the beach is covered with rocks, the sea breaks heavily, and the holding ground is bad.

Atequipa Valley is $3\frac{1}{2}$ miles W. by N. from Tanaca Creek; through it flows a rivulet, and cultivated fields with herds of cattle extend almost to the sea shore. The beach in front of the valley is low and sandy. There is no safe anchorage, nor good landing for boats, owing to the heavy surf.

Following the coast 2 miles further in its W.N.W. course is the small *Ocopa Creek*. The bottom there is rocky, in 7 to 9 fathoms, half a mile from the beach. The country appears cultivated, but the place is without shelter, and the heavy swell makes landing dangerous, and is therefore not suitable for commerce. *Lomas Valley*, 6 miles W. by N. from Atequipa Valley, is wide, covered with vegetation, and bounded North and South by high mountains. A rivulet flows through the valley, but there is neither anchorage nor safe landing.

Lomas Point, 10 miles westward of Chavini Point, projects at right angles to the general trend of the coast, and, like Atico, is all but an island; it may easily be distinguished, although low, from the adjacent coast by its marked difference in colour, being a black rock. *Lomas Road*, on the West side of the point, is the port of Acari, and affords anchorage in from 5 to 15 fathoms, and tolerable landing; it is the residence of a few fishermen, and used as a bathing-place by the inhabitants of *Acari*, which is a populous town 22 miles inland. All supplies, even water, are brought here by those who visit it; the fishermen have a well of brackish water scarcely fit for use.

There are a few huts which are used as stores for the produce of the adjacent estates, sugar, chancaca (a sort of brown sugar), rum, and aguardiente. Copper has been discovered at Acari, and is now worked. The Andes present a magnificent sight all along this part of the coast. *Sombreros* or *Lobos Point*, surrounded by detached rocks, is 7 miles westward of the Port of Lomas.

Port San Juan is 23 miles W.N.W. from Lomas Point, and 8 miles

further is that of *San Nicolas*. The former is exceedingly good, and offers a fit place for a vessel to undergo any repairs, or to heave down in case of necessity, without being inconvenienced by a swell; but all materials must be brought, as well as water and fuel, none being found there.

The shore is composed of irregular broken cliffs, and the head of the bay is a sandy plain; still the harbour is good, indeed much better than any other on the S.W. coast of Peru, and might be an excellent place to run for, if in distress. It may be distinguished by *Morro de Acari*, a remarkable sugarloaf hill, 1,650 ft. high, rising very steeply from the cliff, on the North side of the bay; and 9 miles to the eastward, a short distance from the coast, a high bluff head forms the termination of a range of table-land, and is well called *Direction Bluff*.

At three-quarters of a mile S.W. of *Steep* or *San Juan Point* (the southern point of *Port San Juan*), lies a small black rock, always visible, with a reef of rocks extending a quarter of a mile to the northward; and nearly 2 miles to the S.E. there is an islet that shows distinctly.

Port San Nicolas, 8 miles N.W. of San Juan, is quite as commodious and free from danger as the latter, but the landing is not so good. *Harmless* or *San Nicolas Point* may be rounded at about half a mile. There are a number of scattered rocks to the southward of it, but as they all appear, there is no danger to be feared. There are no inhabitants at either of these ports, so that vessels wanting repairs may proceed uninterruptedly with their employment. The only vessels which visit this place come for the cotton, cochineal, &c., from the neighbouring estates. Piles of cotton-bales for export are almost always to be seen on the beach. The usual berth is in from 6 to 15 fathoms, on the southern side of the bay, near the shore, where boats may be beached in safety, with care.

Beware Point, 8½ miles N.W. by W. from Harmless Point, is high and cliffy, with a number of small rocks and blind breakers in its immediate vicinity. From this point the coast is alternately cliffs and small sandy bays, for 14½ miles to Nasca Point, round which lies Caballos.

Changuillo Gully is 11 miles north-westward of Beware Point. There is some cultivation in it, but there is no anchorage off it. The brig *Hector* was totally wrecked when anchored here, mistaking it for Caballos, which was her destination.

Nasca Point may be readily distinguished; it has a bluff head of a dark brown colour, 1,020 ft. in height, with two sharp-topped hummocks moderately high, at its foot. The coast to the northward falls back to the distance of 2 miles, and is composed of white sand-hills.

CABALLOS, or Nasca Point, is round two other small points in the depth of the above bight. It may be known by a landmark, a pole on a small hill, which, however, should not be too greatly depended on. The best landing-place is near the easternmost rocks on the weather shore. Vessels come here

to load cotton, cochineal, and wines from the surrounding estates. There are no inhabitants, but a small hut stands on the South shore.

Generally, strong southerly winds prevail from 10 a.m. till midnight, and vessels entering should select the morning, and be prepared for strong gusts. After rounding two small points inside Cape Nasca, the flagstaff should be seen; but if it be down, the place where it stood would be a guide for anchoring, being a small hill or mound on the beach.

The most sheltered berth from wind and sea is in 6 fathoms, sand, with the flagstaff W.S.W., about 1½ cable distant. Ships should moor with 70 fathoms of cable. The work of loading, &c., must be done when the wind subsides, and sometimes at full and change of the moon the winds continue through the night.

At 28 miles N.W. by W. ¾ W. from Nasca Point, is *Santa Maria Point*, and the rocks called Infiernillo. The point is low and rugged, surrounded by rocks and breakers. At 4½ miles inland, to the eastward, is a remarkable flat-topped hill, called *La Mesa* or *Table of Dona Maria*, 2,160 ft. high.

Infiernillo Rock lies a mile West of the northern end of Santa Maria. It is about 50 ft. high, quite black, and in the form of a sugar-loaf. The Pacific Mail steam-vessel *Santiago* struck and was nearly lost on it. *Mayro Rock* was reported by a Peruvian transport, in 1876, to lie 1½ mile W. by N. ½ N. from Infiernillo Rock.

From Caballos Road the coast to a short distance West of the small *River Yca* is a sandy beach, with ranges of moderately high sand-hills. *Olleros Point*, low and sandy, is 8 miles westward of Yca River, and off it are two sharp-pointed rocks. Vessels have landed here on the northern side from the neighbouring estates; but it is too exposed, and has been abandoned. From thence to the Infiernillo it is rocky.

At 10 miles N.W. by N. ½ N. from Santa Maria, is *Azua Point*, a high bluff with a low rocky point off it. Between them, on the lofty range of interior mountains, white patches in the form of belts are seen.

At 21 miles N.W. by W. from Azua Point, is *Dardo Head*, the S.E. point of the northern entrance to the Bay of Yndependencia (or Independencia).

INDEPENDENCIA BAY.—This extensive bay, which is 15 miles in length in a N.W. and S.E. direction, and 3½ miles broad, was unknown till the year 1825, and then only by an accidental discovery. The *Dardo* and *Trujillana*, two vessels that were conveying troops to Pisco, ran in, mistaking it for that place, and were wrecked; and many of the people on board perished. It derives its name from the fact that here General San Martin landed with his army, and proclaimed the independence of Peru. It has two entrances: the southern, called *Serrate*, formed by the islets of *Santa Rosa*, on the North, and *Quemado Point* on the South, is three-quarters of a mile wide, and free from danger. Santa Rosa Islet is peaked and of a light colour; in passing it keep on the South side. The *Morro Quemado*, 3,070 ft. high, is very conspicuous

from its proximity to the ocean; it is the northern end of the lofty coast of a light colour.

The northern, or *Trujillana entrance*, to Independencia Bay is named after one of those unfortunate ships, and is formed by *Carretas Head* on the North, and on the southward by *Dardo Head*, so called after her consort. It is 4¾ miles in width, and clear in all parts. The bay is bounded on the West by the islands of *Viejas** and of *Santa Rosa*, and on the East by the main land, which is moderately high, cliffy, and broken by a sandy beach, at the end of which is a small fishing village, called *Tungo*. The people of this village are residents of *Yca*, the principal town in the province, which is about 42 miles distant;† they come here occasionally to fish, and remain a few days, bringing with them all their supplies, even to water, as that necessary of life is not to be obtained in the neighbourhood.

There is anchorage in any part of this spacious bay; the bottom is quite regular, about 20 fathoms all over, excepting off the shingle spit on the N.E. side of Viejas Island, where a bank runs off that spit to the northward, on which there is 5 and 6 fathoms at 1 mile from the island; this is the best place to anchor, for, on the weather shore near Quemado Point, it blows strong with sudden gusts off the high land, and great difficulty would be found in landing; and there is a snug cove or basin within it, where boats may land or lie in safety at any time. At the southern extremity of Viejas there is a remarkable black lump of land, in the shape of a sugar-loaf, off which lies the white level island of *Santa Rosa*, the S.W. side of which is studded with rocks and breakers, but there is no danger a mile from the shore.

The lofty *Carrasco Heights*, 3,000 ft. high, are seen towards the eastern part of the bay. The *Carretas Mountains* enclose its northern side, forming a black rocky promontory, descending in steps southward to a point. From this the coast trends northwardly 4½ miles to *Mount Wilson*, 1,420 ft. high, very bold, and composed of black rocks. Here the coast becomes lower and forms a spacious bay, terminating 10 miles northward of Mount Wilson.

Salinillo Cove is to the North of a point eastward of Zarate Island. It has no shelter whatever, and landing is not safe in the ship's boats, the sea some-

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* On the mountain on the N.E. coast of Viejas Island, there is a large quantity of guano, which has been increased by the birds which abandoned the Chincha Islands when they began to be worked by the Government. It is said that 300,000 tons have thus been added to the former deposits. The place is uninhabited, and therefore destitute of all resources. In 1876 some thousands of tons of guano were exported.

† Yca is moderately large and very agreeably situated. The vine is almost the only object of industry, and flourishes with astonishing facility. The fruit is chiefly employed in making brandy, which, from being shipped at Pisco, is called Aguardiente de Pisco. The vale of Yca supplies all Peru, and much of Chile, with this liquor. A superior and much dearer brandy is also made from the muscatel grape, and called Aguardiente de Italia.—*Von Tschudi*, p. 234.

times breaking in 5½ fathoms. It is the point at which salt is shipped from the Pisco salt-lakes, 3 miles inland. It is uninhabited, except when those engaged in shipping the salt come here, and it has no supplies of any kind. The anchorage is in 8 fathoms, three-quarters of a mile North of Zarate Island, bad holding-ground. At 1 mile W.S.W. from Zarate is *Valdivia Rock*, over which the sea breaks at long intervals.

Mount Lechuza is seen inland. It is 1,300 ft. above the sea, of a light colour, and peaked at the summit. *Cape Paracas* is North of Huacas Point, and is the end of that coast. On the East side of the cape there is a bay, with tolerable anchorage in 6 to 10 fathoms. From this bay the high coast trends easterly, terminating in *Singular Point*, and then runs southward 3½ miles. On the slopes of the mountains, between the two last-named points, are three very large and well-made *stone crosses* of unknown origin or antiquity. This range of high land forms what is called the *Peninsula of Paracas*, joined to the continent on the S.E. by a sandy plain 3 miles wide.

At 20 miles N.W. ¾ N. from Carretas Head, is the *Boqueron of Pisco*, or the entrance to that bay; the shore between forms a deep angular bay, with the *Island of Zarate*, dark coloured, near its centre. The Boqueron is formed by the main land on the East, and the Island of San Gallan on the West.

SAN GALLAN ISLAND is 2½ miles long, N.N.W. and S.S.E., and 1 mile in breadth; it is 1,130 ft. high, with a bold cliffy outline. It is usually the landfall for correcting the position of ships bound to Callao after doubling Cape Horn, or from Australia; the latitude of the northern summit is 13° 50′ S., long. 76° 28′ 30″ W. There is a deep valley dividing the hills, which, when seen from the S.W., gives it the appearance of a saddle, the South end terminating abruptly, while its northern end slopes more gradually and has several peaks. Off the North point are some detached rocks, the northernmost of which has the appearance of a nine-pin, and shows distinctly. At 1 mile S. by W. from the South point of San Gallan, lies *Pinero Rock*, which is much in the way of vessels bound to Pisco from the southward; it is just level with the water's surface, and in fine weather can always be seen; but when it blows hard and the weather tide is running, there is such a confused cross sea, that the whole space is covered with foam, rendering it difficult to distinguish the rock. At such a time the shore should be kept well aboard on either side, and when in a line between the South point of the island and the white rock off *Huacas Point*, you will be within the rock, and may steer for Paracas Point, on rounding which the Bay of Pisco will open.

PISCO.—This extensive bay is formed by the *Peninsula of Paracas* on the South, and the Ballista and Chincha Islands on the West. The town of Pisco is built on the East side, about a mile from the sea, and is said to contain about 3,200 inhabitants. The principal church, with two white steeples, which can be clearly distinguished, is an excellent mark for making out the port. Preserved and all kinds of fresh provisions and fruit are to be had in

abundance. Large quantities of spirit, called pisco or italia, are exported, also wool and cotton.

The trade and importance of Pisco vastly increased when the Chinchas were so much resorted to. The steamers from Panama, &c., call regularly and the wealth thus brought to it has left its impress on the permanent fortunes of the place. The pier is one of these improvements. It consists of iron columns, supporting a wooden platform, extending 2,250 ft. into the sea. Landing may be effected, whatever may be the state of the sea, at the staircase at its head, as it reaches beyond the point where the rollers commence; the span between this and the surface on the beach is generally 1,500 ft. or more. This part is called *la tasca*, and many lives were lost in it before the pier was completed. The offices of the coast-guard and the captain of the port are on each side of the pier-head. Iron pipes conduct *water* for shipping to the pier-head.

Light.—At the end of the mole in Pisco Bay is a lighthouse, 46 ft. above the level of the sea. It is stated to exhibit a *fixed red* light, which can be seen in clear weather from a distance of 3 miles. The light is intended to indicate the landing-place and the anchorage at night.

The Railroad to *Ica* or *Yca*, 48 miles long, was built by capital guaranteed by the Peruvian Government. A line of railway is proposed to be constructed to connect Lima with the port of Pisco, a distance of 145 miles, which would open up some of the richest sugar estates on the coast.

The bay affords no shelter from the swell which continually sets in from the S.W. The beach is even and low, forming an anchorage in 4 to 7 fathoms, oazy bottom. The best place to anchor, for receiving and discharging cargo, is on the South side of the pier, about a cable off shore in 4 fathoms. Vessels drawing more than 17 ft. should anchor a little further off, to guard against the frequent heavy swell and the rollers. The *best anchorage* off the town is with the church open of the road, bearing E. by N. $\frac{1}{4}$ N., in 4 fathoms, muddy bottom, three-quarters of a mile from the shore. From 11 a.m. until sunset there is often a strong southerly breeze, known as the *Paracas*, so called from its blowing over the peninsula of that name. When this is on it is necessary to suspend work, as the boats cannot then land or embark cargo. On this account care should be taken to have a good anchor out with not less than 45 fathoms of chain.

Loading and unloading vessels is done by launches from the shore; they run aground in front of the warehouse on the South side, and are secured by means of a guest warp, one end anchored out, the other fast to the shore.

There may be said to be four anchorages to the capacious Bay of Pisco: the Boqueron, already mentioned; that between San Gallan and Ballista Islands; another between those and Chincha Islands; and the northern entrance between them and the main. *Tres Marias Islets* are three small rocks, $1\frac{1}{2}$ mile

southward of the Ballista Islands; about 3 cables N.N.E. from their North end, and about 7 cables S.E. by S. from the south-eastern end of the second of the Ballista Islands from the northward, lies *Salcedo Rock*, which has 3 ft. on it at low water, with 4 fathoms close-to.

In coming from the southward, after passing Paracas Point, a course may be shaped to pass close southward of Blanca Island, in order to give a berth to some shoal ground to the N.E. of the head, and then towards the church of Pisco, which will lead directly to the anchorage. Abreast of the island you will have 12 fathoms, muddy bottom; and from this depth it decreases gradually to the anchorage.

In coming from the northward it is all plain sailing; after passing Chincha Islands, stand in boldly to the anchorage; the water shoals quicker on this side of Blanca Island, but there is no danger whatever. Vessels having to ballast here, should work up and anchor under Shingle Point; they can lie close to the shore, and boats may land with expedition.

In coming from seaward, this part of the coast may be easily known by the Island of San Gallan, and the high *Peninsula of Paracas* at the back of it, which make like large islands, the land on each side being considerably lower, and falling back to the eastward, so as not to be visible at a moderate distance. As the shore is approached, the Chincha and Ballista Islands will be seen, which will confirm the position; there being no other islands lying off the coast near this parallel.*

Pisco River is 2½ miles North of the Pisco warehouses. There is plenty of water in the mouth during the summer, but it runs dry in the winter. E.N.E. of the river are some hills called the Caucato Helghts, the only ones hereabout.

Caucato.—To the North of the heights the coast forms a small bend, known as the Port of Caucato. It is an unsheltered anchorage, and the heavy swell renders it impracticable to land in boats; launches are therefore taken from Pisco for the purpose. The beautiful *Valley of Chincha* commences here, and the products of its cultivation, sugar, wine, vegetables, &c., are shipped at Caucato. At 9 miles from Pisco River along the low and sandy coast is the mouth of the *Chincha River*, with abundance of water from January to May; the rest of the year the water is drawn off for irrigating the valley.

Tambo de Mora is just to the North of the mouth of the Chincha River. It has been opened for a few years as a port for shipping the produce of the Chincha Valley. The best direction which can be given for finding the anchorage is to note the end of the valley or low beach, and at 1 mile before reaching the light-coloured cliffs to the North you should anchor. Lieut. Lang. H.M.S. *Mutine*, 1882, states that upon the lower part of these cliffs, at

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* Capt. Livingston, when off Pisco, August 26, 1824, in lat. 13° 56′ 28″ S., long. 78° 30′ W. found the water much discoloured, indeed quite green.

1¼ mile South of Topara River, is a conspicuous clump of underwood. Also a noticeable white house upon the beach of the port.

Small vessels are nearly always to be found at this anchorage. The small village can be seen on the beach. The bottom is muddy in from 3½ to 5 fathoms, at half a mile from the beach, but quite open to the S.W. swell, and, as sudden changes in the wind occur here, they should be guarded against. The steamers anchor in 4¾ fathoms, with the white house bearing E. by S.

CHINCHA ISLANDS, consisting of three principal islands, and a few outlying rocks, have been one of the principal points of commercial interest on the South American coast. The guano upon them, which exceeded greatly in abundance that on the well-known Island of Ichaboe, similarly situated in respect to the African coast, was the object of a very considerable shipping trade. They were not very perfectly surveyed by the *Beagle*, but are now so well known, that there will be no difficulty in making or approaching them.

North Island, is about two-thirds of a mile long, and the boat-slip near its S.E. point is in lat. 13° 38′ 20″ S., long. 76° 23′ 5″ W.; it bears W. by N., 10½ miles from Pisco, and contained the principal deposit of guano,* which was shipped from two wharves; one on the North end, the other on the East side up to which the guano was brought on tramways. About a cable off shore, on the N.E. side of the island, is *Peacock Rock*, with 5 ft. water on it, and about 1¾ cable S.E. of it is another sunken rock. They are each marked by a *red* buoy, but should the buoys be gone at any time, the East point of the middle Chincha kept open of the S.E. point of North Island, until the N.W. rock opens of that island, will clear these dangers.

Middle Island is separated from North Island by a channel 4 cables wide. *South Island*, the residence of the authorities, is divided from Middle Island by a shoal channel 2 cables wide, which has some dangers in it. At the N.W. end of South Island are some high rocks, or farallones, and eastward and southward of it are numerous rocks, some above water. At 8½ cables S.W. ½ S. from its South point is *Goleta, Schooner*, or *Sugar Loaf Islet*, 170 ft. high, the

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* The great deposits on the Chincha Islands, which were used by the coast agriculturalists in the time of the Yncas, are now nearly exhausted. They have been worked for the European markets since 1846. In 1851 the amount of shipping which loaded at the Chinchas represented a tonnage of 191,000; from 1851 to 1860 it was 2,860,000, and the yearly mean during that period was 286,000 tons. Between 1853 and 1872 there were 8,000,000 tons shipped from the North and Middle Islands. The Chincha Islands ceased to be worked for export to foreign countries in 1872, and now only Peruvian vessels load guano for use in Peru, at the northern island, where there are still believed to be 150,000 tons. In 1874 the North Island was visited by 35 Peruvian vessels, which shipped 11,634 tons. Vessels must first procure an order at Callao for loading. The population of the three islands was 6,000 in 1868. In 1874 there were 105 persons on the North Island, and none on the others.

highest and westernmost of three islets lying on a bank 3 cables in extent East and West. At half a mile S.S.E. of Sugar Loaf Islet is a small hummock called *Flat Rock*.

Although the depth of water is great, the anchorage may be considered secure, as it never blows strong, except from the southward; the breeze from that quarter is termed the "Paraca" (coming from the peninsula of that name), but as the merchant ships usually anchor to the northward of the island, they are consequently sheltered from its violence. The best anchorage is between North and Middle Chincha, in 18 or 19 fathoms (white sand and shells), taking care to be a little to the eastward or westward of the mangaras or guano hoses, to avoid the dust that is blown from them (when the southerly wind sets in), which is disagreeable and offensive. In proceeding from Callao to the Chincha Islands, it is recommended to stand off the land at night, and towards it during the day, until to the southward of lat. 13°, when it is advisable to keep within 4 or 5 miles of the shore down to Pisco. The currents are uncertain at the Chincha Islands, but generally set to the northward about 1½ knot per hour.—*Mr. W. Dillon, R.N.*

Cerro Azul.—From Pisco the coast, a low sandy beach with regular soundings off it, runs in a northerly direction 13 miles, as far as the River Chincha, before described, and from thence to the *River Canete*, 27 miles to the north-westward, it is a line of clay cliffs, from 430 to 540 ft. high. From this river to *Frayle Point*, a distance of 7 miles, a beautiful and fertile valley fringes the shore, and to the north-eastward of Frayle Point stands the town of Cerro Azul. The anchorage is W.N.W. from the bluff that forms the cove, three-quarters of a mile distant, in 7 fathoms; nearer the shore the water is shoal, which causes a long swell. The landing-place is on the northern side of Frayle Point, on a stony beach, where a heavy surf, however, constantly breaks. A wooden pier connected with the works of Quebrada and Casa Blanca, also affords facilities for landing and commerce. This valley produces rum, sugar, and *chancaca*, large cakes of brown sugar, for which it is resorted to by coasters.

Point Loberia, somewhat projecting, is 5½ miles northward of Cerro Azul, and at 9 miles farther is *Malpaso de Asia Point*, a small cliff detached from a low sandy beach.

There are no objects of interest between this and *Asia Islands*, which are distant 17 miles N.W. ½ N. from Cerro Azul, and are merely a patch of high rocks, projecting about 2 miles to seaward from a very flat sandy beach, having a channel carrying 4 fathoms, but well studded with rocks, which by daylight are easily avoided. *Asia Peak* is situated in lat. 12° 48′ S., and its island (like a white army tent) is about half a mile long by a quarter of a mile broad, having no vegetation. There is good landing in a very snug bay, on its eastern side. Between Cerro Azul and Asia Island the coast is dangerous,

and landing generally impracticable, but the lead will always afford timely warning.—Sir E. Belcher, R.N., H.M.S. *Sulphur*.

Chilca Point, 20 miles N.W. from Asia Islands, forms a sharp elbow in the land. It is about 300 ft. high in its highest part. A remarkable peak, called *Devil's Peak*, rises about 300 ft. perpendicularly, and forms the eastern limit. At 2 miles northward of Chilca Point lies the *Port of Chilca*, a small but safe cove, formed by an island, which enables vessels of small draught to lie in a complete dock, land-locked, with 5 to 7 fathoms, the outer harbour having good anchorage in 10 to 14 fathoms. A small village of huts, with a chapel, is situated on the eastern beach of the inner harbour, and is merely the resort of fishermen, and of those employed in the extensive salt lakes. The whole soil is entirely impregnated with salt.

From Chilca the coast forms a bend for 10 miles to the *Valley of Lurin*, off which are Pachacamac Islands. About midway is *Curayacu Creek*, with shelter for small coasters, and a landing place. At 1 mile southward of it is another small creek named *Santa Maria*. At 6 miles farther to the northward is *Pescadores Creek*, 2½ cables in depth by 8 cables wide, with a reef extending 3 cables seaward of its South point. There is anchorage in 9 or 10 fathoms, about a mile off shore, but there is a heavy swell; landing can be effected occasionally. *Lurin* is a town one-third of a mile inland, at 12 miles northward of Chilca. It stands on a periodical river, and is frequented by the people from Lima at times.

Pachacamac Islands.—The northern is the largest, half a mile in length, and about a cable's length broad; *San Francisco* is the most remarkable, being quite like a sugarloaf perfectly rounded at the top, 350 ft. high; the others are mere rocks, and not visible at any distance. At 1 mile to the S.E. is *Corcovado Reef*, 1 mile in extent. At the northern end of these islands lie *Viuda Rocks*, even with the water's edge. The group runs nearly parallel to the coast, in a N.W. and S.E. direction, and is about 3 miles in extent. There is no danger on their outer side, but towards the shore the water is shoal, which causes a long swell to break there heavily. This island is one of the most interesting places on the Peruvian coast. At the time of the Spanish invasion it was connected with the main land, and formed a promontory. Possibly it may have been detached from the coast during the great earthquake of 1586. On the summit of a hill on the island is the Temple of Pachacamac, or Castle, as it is called by the Indians, a square edifice of three terraces, built of rock, and covered with sun-dried bricks.

Morro Solar.—From Lurin to the Morro Solar is a sandy shore, 10 miles long, called *Conchan Beach*, with moderately high land a short distance from the sea. Morro Solar, or *Salto del Fraile*, is a remarkable cluster of hills, 890 feet high, standing on a sandy plain; when seen from the southward it has the appearance of an island in the shape of a quoin, sloping to the westward, and

falling very abruptly in-shore. On its sea-face, however, it terminates in a steep cliff, called *Codo Point*, with a sandy bay on each side.

At 4 cables off *Solar Point*, the S.W. point of the Morro, there is an insignificant islet, with some rocks lying about it, and off *Chorillos Point*, nearly 3 miles to the northward, a reef of rocks projects about 2 cables' lengths; round this reef, on the North side of the Morro, lies the town and road of *Chorillos*. The former is built on a cliff, at the foot of one of the slopes of that mountain.

Chorillos, 6½ miles to the South of Lima, is the favourite watering place, and is frequented by the people of Lima during the bathing season, January to April. It is only a pleasure resort. Water is now brought by pipes to the public square and other parts. *A railroad*, 9 miles in length, constructed in 1857-8, connects it with Lima.

Miraflores is 3 miles North of Chorillos, on the same bay, and on the cliff. The *Surco* rivulet supplies the place with water. At about 6 miles W. by S. ½ S. from Miraflores, and 3 miles off shore, is an islet, 70 ft. high, called *La Horadada*, from its being pierced through, lying towards the middle of the bay. The part of the beach lying between Miraflores and Callao Point is called *La Mar Brava*, from the heavy surf thrown on to it.

Chorillos Bay has very foul ground, hard sand, with patches of stones and clay mixed together. A reef lies off from the S.W. point of the bay (N.W. of the Morro Solar); from the break it seems to extend 1½ or 2 cables' lengths from the point, and a good berth ought to be given to it. Sailing vessels anchoring in Chorillos Bay should keep Solar Point open of Codo Point; by so doing they will ride in 8 or 9 fathoms, and not have so much swell as there is farther in. Steam vessels may anchor nearer the town in 6 fathoms, but the islet off Solar Point should not be shut in by Chorillos Point.

The landing in the bay is bad; canoes built purposely, and dexterously managed, are the usual means of communication; for though, no doubt, there are times when a ship's boat may land without danger, yet seldom without the crew being thoroughly drenched. When the swell is not too heavy, landing may be had at the pier, on the end of which there is a flagstaff.

From Chorillos the coast runs in a steady sweep, with cliffs, diminishing in height, till it reaches the Point of Callao, which is a shingle bank, stretching out towards the Island of San Lorenzo, and which with it forms the extensive and commodious Bay of Callao.

CALLAO AND LIMA.

CALLAO is the port of Lima, the Peruvian capital, 7 miles distant, at the foot of the mountains. The harbour is protected from the Pacific by the Island of San Lorenzo; the town standing on a sandy peninsula, which projects beyond the general line of coast towards the middle of the island.

The Bay of Callao forms a fine harbour. The climate and prevalent winds from the southern quarters render it so. Its northern side is entirely exposed, but there is no danger to be apprehended from that quarter. San Lorenzo keeps off all swell from the shore immediately around the town, but a few miles to the northward the surf breaks heavily on the beach, and effectually prevents all landing.

The small strait separating San Lorenzo from the land will perhaps afford some insight into those remarkable geological changes which have occurred in the coast and land of Peru. Mr. Darwin considered that this part of the land has risen 85 ft. since it had human inhabitants. There are statements that the land *sank* at different periods, among others in 1746, when the great earthquake swallowed up the city of Callao; the ruins upon the tongue of land from the fortress, supposed by Darwin to be of this city, are those of Callao, destroyed in 1630. Subsequently to this it must have been upheaved, for boys used to throw stones over to the island. At present the distance is nearly 2 English miles. Another proof of sinking is the shoal between the coast and San Lorenzo, called the Camotal, which in early times was cultivated, particularly with *camote* (sweet potatoes), hence its name. This occurred, perhaps, in 1687 or 1630.

Callao, since the accession of wealth brought here by the Chincha guano trade and the railways, has much improved in condition; its population at the last census amounted to 38,000. All vessels loading at the Chincha Islands are obliged to clear here on their arrival and departure; the port dues amount to about 3½ dollars per ton. The Forts of San Sebastian and San Rafael still exist, but the castle, long the key of Peru,* is dismantled, and converted into a better use, viz., that of a custom-house. On January 18th, 1881, the Chilians landed here, after a blockade of about 9 months, and proceeded to blow up and dismantle the fortifications.

Docks.—The Port of Callao has been much improved by the construction of

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* Prior to its destruction, the collection of batteries, known under the name of the Castle of Callao, had an imposing appearance. One of the scenes for which it is best known to Englishmen is the exploit of Lord Cochrane, who cut out the *Esmeralda* Spanish frigate, by means of fourteen boats, on the night of Nov. 5th, 1820, from under its guns, thus destroying the Spanish naval power in the Pacific, and giving a great impetus to the success of the Chilians against the Spanish domination.

docks, which were commenced in 1871, and completed in 1875. There is a total length of 4,520 ft. of sea wall, enclosing 52 acres, with berthing accommodation for thirty large vessels in a minimum depth of 26 ft. In addition to the dock wall, a long sea wall has been built round the bay, reclaiming a space equal to 13 acres, where warehouses have been erected. The breakwater is 600 ft. long, and the opening into the dock 96 ft. There are eighteen steam cranes, a triple line of railway along the whole length of the dock wall, a light-house, and a supply of fresh water at eight points for the use of shipping. There is also a camber, 820 ft. long by 676 ft. broad, for loading and discharging vessels, and other works were in progress for extending the accommodation.

Previous to the construction of these docks all goods were landed by lighters. Three chief moles were used, viz., the old mole, at which the railway, 6 miles long, from Lima terminated; Chacuito mole, on the South coast, used for the dischage of corn and flour, had the terminus of a railway from Bellavista upon it; and a new mole has been constructed on the eastern part of the bay for the terminus of the Trans-Andean railway.*

Lights.—Three *fixed red* gas lights are shown at the landing place, two at the right side of approach, and one on the left side. A *fixed bright* lantern light is shown on the dock wall head, in the eastern part of the bay.

The iron floating dock, named St. George's Dock, is of great service. Its length is 300 ft., and the breadth inside 76 ft. It can be sunk to a depth of 33 ft., and will take in a ship 340 ft. long, drawing 21 ft., or weighing up to 6,000 tons. The rates for steamers are 1s. 6d. per diem per ton for the first day, and 1s. per ton for all subsequent days. Sailing vessels 1s. 3d. per ton for the first day, and 9d. for all subsequent days.

Repairs can also be done by heaving down, which, however, is liable to interruption by the rollers, at full and change, and during the equinoxes.

The value of imports, in 1871, was £2,375,528, chiefly in coal and articles for domestic use; exports, £3,971,968, consisting of cotton, sugar, rice, nitrate, guano, bark, cochineal, oxen, sheep, goat-hides, wool, bullion, &c. In 1879, 1,417 vessels, with a total tonnage of 647,830, entered the port, of which, 600 vessels, with a total tonnage of 507,246, were British. In the same year the value of the imports amounted to £1,047,421; and the exports to £332,676.

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* The railroad from Lima, across the maritime Cordillera of the Andes to Oroya in the *sierra* valley Xauxa, is 136 miles long, of which 80 miles were finished in 1877. The work was commenced in 1870, and Mr. Meiggs had undertaken to complete it in 1876. It is thus described by Professor Orton :—"Starting from the sea, it ascends the narrow valley of the once sacred Rimac, rising the first 46 miles nearly 5,000 ft. Then it threads the increasingly intricate gorges of the Andes, by a winding giddy pathway along the edge of the precipices and over bridges that seem suspended in the air. It then tunnels the Andes at an altitude of 15,645 ft., the most elevated spot in the world where a piston-rod is moved by steam, and terminates at Oroya, 12,178 ft. above the sea."

In 1882, 808 vessels, with a total tonnage of 612,852, entered, of which 464, with a total tonnage of 434,326, were British; the port was then under Chilian rule. Supplies of all sorts, including fresh provisions and vegetables, may be obtained here; coal, also, is abundant and cheap.

Climate.—Callao may be said to enjoy uninterrupted fine weather at all seasons of the year, and the heat is seldom oppressive.* The sea breeze from S.S.E. to S.E. sets in regularly between the hours of 11 a.m. and 2 p.m. with the force of a royal breeze, when the anchorage is cool and pleasant; the nights are generally cool. The early mornings are frequently damp and misty.

Occasionally yellow fever occurs. In March, 1868, the number of deaths at Callao amounted to 60 daily, and at Lima from 250 to 280 daily, when Chorillos was but slightly visited. During that period the weather was unusually hot, being 82° in the shade. In such cases the anchorage at the entrance of the Boqueron, off the sunken dock, will be found healthy, as there is nearly always a breeze.

The *hospital* is clean, commodious, and healthy; merchant seamen and the crews of H.M. ships are carefully treated in a special ward. A tax of 2d. per ton is levied on all shipping entering the port for its support.

LIMA.—The city of Lima stands on a plain, in a valley formed during the gradual retreat of the sea. It is distant 7 miles from Callao, and 420 ft. above the sea; but from the slope being very gradual, the road appears absolutely level, so that, when at Lima, it is difficult to believe that one has ascended some hundred feet. Steep barren hills rise like islands from the plain, which is divided by straight mud-walls into large green fields, having only a few willows here and there, and an occasional clump of oranges and bananas.—(Mr. Darwin.)

The capital of Peru was founded by Pizarro, Jan. 15th, 1535; he is buried in the cathedral of this "City of the Kings," as he named it. Its present name is derived from the river which flows through it, the *Rimac* of the Peruvians, softened into its present European form by the Spaniards.

The houses are tolerably built of adobes, or sun-dried bricks, canes, and wood; they are low, in order to stand the shocks of earthquakes. For the climate these houses are, however, sufficiently well adapted. The cathedral, the palaces of the government and of the archbishop, the university, several colleges, and some churches, are the most remarkable edifices. The population was estimated by the census of 1876, at 100,000. There are several unimportant manufactures carried on. Its trade in foreign merchandize, and its exports of

* A nauseous smell, usually called the *Painter* or *Barber*, is frequently experienced by vessels in this port. It deposits on white paint and whitewash a thick slime of a chocolate colour, washing off from the former, but spoiling its after appearance; it is supposed to proceed from the mud at the bottom of the sea (probably sulphuretted hydrogen).

the produce of the mines, and of the interior, are through the Port of Callao. Its water supply has recently been augmented by the construction of dams at the sources of the Rimac, just below the snow line of the Andes, thus preventing waste during the winter months.

SAN LORENZO ISLAND rises to 1,284 ft. at its highest part; it is 4½ miles long N.W. and S.E., and 1 mile broad. At 4 cables off its S.E. end lies a small, but bold-looking island, 503 ft. high, called Fronton; and about 3 miles to the S.W. by W. are the Palominos Rocks, 140 ft. high, on which it is proposed to erect a *lighthouse*. Its northern point, or *Cape San Lorenzo*, on which stands the lighthouse, is clear, and round it is the usual passage to the anchorage at Callao.

Light.—The lighthouse on Cape San Lorenzo is a wooden octagonal tower, 60 ft. high. It stands on the summit of the cape, and exhibits, at an elevation of 980 ft. above high water, a *fixed bright* light, visible in clear weather at a distance of 12 miles. Between the bearings of N.W. ¾ N. and W. by N. ¾ N. it is hidden by the peak of the island; and when just open on the latter bearing it leads through the Boqueron Channel in 4½ fathoms. From its lofty position, however, this light is not always seen, being often enveloped in the thick fog or haze which hangs over the high land, causing it at night to appear like a star only.

In rounding it a sailing vessel should not close the land nearer than half a mile, for within that distance there are light baffling airs, caused by the eddy winds round the island, by getting among which she would be more delayed than if she gave the island a good berth, and should have to make an additional tack to fetch the anchorage.

There are no dangers in working in, except the long spit that stretches off from Callao Point towards San Lorenzo Island; part of it, the *Whale's Back*, just shows at the water's edge, and the sea breaks violently along its ridge. The two buoys marking it were stated to be not in position in October, 1882. Callao Point is very low, and consists of a bank of small round stones, as far nearly as the battery of San Rafael.

Should there be occasion to work to windward to fetch the anchorage, the above shoal with another rock, said to lie off Galera Point, San Lorenzo Island, are so far to the southward that you need scarcely apprehend borrowing on them. Run or work up close to the shipping, and anchor in from 7 to 5 fathoms, with the old mole head bearing about S.E., and Cape San Lorenzo W. by S. Although the above mark is given for the most convenient anchorage, yet ships may lie with the greatest safety in any part of the bay, and in any depth of water, on clear ground and gradual soundings, from 20 to 3½ fathoms, up to the harbour works before described. In 1880 numerous torpedoes were reported to be floating in the road.

Boqueron Channel.—The above is the obvious route to Callao; but there is another which, with common precaution, may be used to great advantage, by

vessels of moderate draught coming from the southward, by passing through Boqueron Channel between San Lorenzo Island and Callao Point.

Vessels drawing more than 20 ft. are recommended not to use this channel unless well acquainted with it. A good leading mark for the deepest water is the lighthouse on San Lorenzo Island in line with a factory chimney near the sunken lift-dock, W. by N. ½ N.; this will lead through in not less than 5 fathoms, passing about a cable's length westward of the S.W. spit of the Whale's Back. The lighthouse in line with a large square house near the above chimney leads over Fronton Shoal in 4 fathoms. Between these marks is the fairway of the channel. The sunken lift-dock lies about 2½ cables East of the point on which the factory, which was used in connection with it, stands.

The S.W. spit of the Whale's Back, composed of coarse white sand and broken shells, is dangerous and steep-to, the water deepening from 22 ft. to 10 fathoms in a ship's length; the heavy surf also that sets in about full and change *frequently alters it*, making the channel much narrower.

The directions given prior to the erection of the lighthouse were:—After making Fronton Island, steer so as to keep its southern end about a point open on the port bow; continue on this course until Callao Castle is seen, which has two martello towers on it, and stands on the inner part of the shingle bank that forms the point; then steer for that castle till Horadada Rock (which has a hole through it) comes in one with the middle of the southern sandy bay of Morro Solar, bearing about E.S.E.; with these marks in one, and steering about W.N.W. for the farthest point of Lorenzo that can be seen, you will be clear of all danger; and when the western martello tower in the castle comes in one with the northern part of Callao Point, you may haul gradually round to the northward till that tower opens clear of the breakers on the spit, when a direct course may be shaped for the anchorage, taking care not to come nearer the sand called the Whale's Back than 6 fathoms. There is no regular tide in this passage, yet a little drain is always felt, sometimes to the N.W., and at others the contrary; should the stream be adverse, and it fall calm while in the channel, there is good anchorage in 8 or 9 fathoms, with the leading marks in one.

These marks will also lead clear of the bank that extends three-quarters of a mile to the northward of Fronton Island; and as soon as the rock between Fronton and San Lorenzo bears S. by W., the Fronton Shoal will have been passed, and San Lorenzo may be approached as above directed.

The lighthouse, if seen, affords a better mark for running through the Boqueron. Haul to the N.W. directly it opens, and run through with its South base just touching the high land; when the round islet between Fronton and Lorenzo is shut in, steer N.N.W. till the cliff of Cape San Lorenzo is well open, bearing W. ½ N., then steer a direct course for the anchorage.

In March, 1849, Capt. Thomas Harvey, R.N., worked through this channel in H.M.S. *Havanna*. The following are his remarks: Finding that the guano

laden ships were not allowed to run through the Boqueron, in consequence of reported errors in the charts, and that the loss of sundry vessels was attributed to these errors, or shifting sands, the passage was sounded, and the *Beagle's* survey of 1835 verified, so far as the channel portion of it was concerned, and found to be correct; Mr. Hull, master, selected such turning marks as would enable ships drawing 24 ft. to work out through the Boqueron.

On weighing from Callao Road, steer for the North peak of San Lorenzo till Horadada Rocks open of Callao Point; then S.W. ½ W. for a sandy bay, in which is the sunken lift-dock; and when the cliffs of Fronton and San Lorenzo touch, haul to the wind, and tack when the hole in Round Islet is shut in by San Lorenzo. When standing towards the Whale's Back, tack directly the cliffs of Fronton and San Lorenzo open; vessels drawing 24 ft. and over should tack a little before, when a conspicuous dark mark on Fronton opens. When the cliff of the red bluff on San Lorenzo is in line with a saddle on the summit of the island, bearing W. ½ S., a vessel will be clear of the Callao Shoal, and may stand to the eastward. Very little current was found in the channel, the set is generally to the northward; it is therefore necessary to watch the last-named mark in standing away to the eastward.

This northerly set is, at times, considerable outside Fronton Islet, near which the winds, when light, are baffling and treacherous, it is consequently advisable to give it a berth of at least half a mile. In the narrows, when standing over to the Whale's Back, the first shoal cast gives timely warning to tack. The bold appearance of San Lorenzo has led strangers to suppose themselves nearer to it than they were, and the fear of approaching it has been the cause of getting on the Callao Shoal.

The River Rimac is 2 miles North of Callao, but is usually almost dissipated before it reaches the sea. During January and February, when the freshets come down, large quantities of sand and boulders are carried into the sea, causing the shoal water to extend seaward. Vessels of 23 ft. draught should not approach the shore in this vicinity nearer than 1½ mile.

Carabaillo River falls into the bay 5 miles farther to the northward, and at 4 miles W. by S. from the entrance lies the wreck of the Peruvian transport *Loa*, in 15¾ fathoms. All this part of the coast is very shoal from the sand brought down from these rivers. At 2½ miles farther is an isolated sharp-pointed hill, called the *Morton de Trigo* (wheat-stack) from its form. *Vernal Point* in front of it is low.

HORMIGAS.—Nearly due West from the North end of San Lorenzo, at the distance of 31 miles, lie a small cluster of rocks called the *Hormigas de Afuera;* the largest is about three-quarters of a mile in circumference, 25 ft. high; no sign of vegetation was observed. It is merely a resting place for birds and seals; landing might be effected, if requisite, on its North side, but with difficulty. The northern rock is 1 mile from the southern or highest, and from it a reef extends a short distance to the northward; and from the southern rock

breakers extend about 1½ cable to the south-eastward. Being somewhat in the way of vessels bound to Callao from the northward, and of those leaving that port for the West, care should be taken not to approach too closely, for fear of being overtaken by dense fog, so frequent on the Peruvian coast, while in their neighbourhood. The water is deep close-to all round, and no warning would be given by the lead. Several vessels have been lost on these rocks.

The Cordillera of the Andes, on this part of the Peruvian coast, approach it within 60 or 70 miles. Of their elevation we have but few measurements. One singular feature of this part of the range is, that it seems to be rather a continuation of the eastern range, with which it unites at the back of Arequipa, than the western chain of the Bolivian Andes. Several of the peaks to the South rise above the limits of perpetual snow. The best known are the Toldo de la Nieve, S.E. of Lima, from which it is seen; the Altunchagua, about 10° South lat.; and the Nevado de Guaylillas above Truxillo, or 7° 50′ S.

From Callao the coast is a sandy beach, running in a northerly direction, 13 miles, until it reaches *Pancha Point;* it there becomes higher and cliffy, and maintains this character for 4 miles as far as *Mulatas Point*, round which is the little *Bay of Ancon*, now rising into importance.

Pescadores.—To the West and S.W. of Mulatas Point lie the *Pescadore Islands*, the outer and largest of which bears N.W. by N. ¼ N., 18 miles from Callao Castle, and 3¾ miles W. by S. ½ S. from the point. With the exception of a sunken rock to the eastward of the larger islet, there appears to be no danger among these islands; they are whitish and steep-to, with from 10 to 30 fathoms near them. At 1 mile N.N.W. of the largest island are two steep rocks called the *Hormigas de Tierra.*

ANCON BAY is not easily made out from the southward until abreast Mulatas Point, but there is no difficulty in finding it, as the ship's position can be ascertained by bearings of Pescador Islands, and a direct course steered for it. The bay affords shelter from all winds, but those between N.N.W. and West. Anchorage was had by H.M.S. *Chanticleer* in 5 fathoms, with Mulatas Point W. by N., and the town of Ancon S.E. by S., when there were eight ships at single anchor with swinging room. In 1880 numerous torpedoes were stated to be floating in the bay. A town is built, a station on the *railway* from Lima to Chancay is completed, and Ancon is expected to be a flourishing commercial place. Provisions of all kinds can be procured, but water is scarce. In 1876, 61 vessels, with a total tonnage of 11,907, entered the port.

North of Ancon Bay the hills approach the coast, leaving in some places not a path at their base. Several detached rocks lie a distance of 2 cables to the northward of this point. In calm weather boats can make a landing on a small beach.

Bay of Chancay.—At 12 miles N.W. by N. from Mulatas Point is the *Bay of Chuncay* or *Pasamayo*, northward of the river of that name; this bay

may be known by the bluff head that forms the point, and has three hills on it, in an easterly direction; it is a confined place, and fit only for small coasters. The town stands on the plateau 1½ mile distant, and is connected by railway and telegraph with the capital, 43 miles distant. From Chancay, the coast runs in a more westerly direction, for 27 miles, as far as *Salinas Point;* it is a shingle beach, with a few broken, cliffy points; the hills are near the coast, and from 400 to 500 ft. high.

POINT SALINAS, 27 miles N.W. by W. ½ W. from Chancay Head, is at the South end of Salinas promontory, which is 5 miles in length, in a North and South direction. Off its southern face there is a reef of rocks, a quarter of a mile from the shore; and at its northern angle, called *Bajas Point*, an islet at a cable's distance; two coves, between these points, are only fit for boats. There is a remarkable round hill 930 ft. high, called *Salinas*, at a short distance from the coast, and further in-shore, a level, sandy plain, at the South side of which plain lie the Salinas, or salt-ponds, that give the headland its name. These ponds are visited occasionally by people from Huacho.

Misteriosa Rock, nearly a mile off shore, midway between Salinas and Bajas Points, breaks occasionally. From it Mount Salinas bears N.E. by E. Great care should be taken to preserve a proper offing when in its vicinity (11° 16′ S.). as it is directly in the track of vessels bound from Callao to Huacho.

HUAURA ISLANDS.—At 2 miles S.W. of Salinas Point lies Tambillo Islet, the easternmost of Huaura Islands, the largest of which is called *Mazorca* or *Mazorque*. The latter, 7 miles S.W. ½ S. from Salinas Point, is 200 ft. in height, three-quarters of a mile long, and quite white; sealers occasionally frequent this island, as there is a landing-place on its North side.

The next in size, and the outermost, is *Pelado*, which lies S.W. ½ W. 6½ miles from Mazorque, is about 150 ft. high, apparently quite round; and between these two islands a safe passage exists, which may be used without fear in working up to Callao. Between Mazorque and Salinas are several other islands, which from their appearance may be approached without danger. The island nearest to Salinas is *El Tambillo;* 1 mile from this are the two *Chiquitana Islets;* at 2 miles further are the *Brava* and *Quita-Calzones Islets*. Two of the channels between them are used by steamers. The inner one is narrow, between the main and Tambillo, rather a blind object at night; the other, between Mazorque and Pelado, a high conical rock, as seen from the S.E., is much used, being 6 miles wide, and quite free from danger.

Salinas Bay, eastward of Bajas Point, is of large dimensions, and affords roomy anchorage. *Playa Chica* is in the easternmost part of the bay, and affords the best anchorage in 4 to 8 fathoms near the shore. Shipments of the famous Huacho salt are made from here, by means of boats landing on the

beach. The Salinas are 5 miles South of it, and are proposed to be connected with this place by a tramway. There is neither water nor provisions.

HUACHO BAY.—From Salinas the coast is moderately high and cliffy, without any break for 5 miles to the *Bay of Huacho*, which lies round a bluff, *Huacho Head*, and is small, but the anchorage is good, in 5 fathoms, just within the two rocks off the northern part of the head. The town of *Huacho*, with about 1,800 inhabitants, is built about a mile from the coast, in the midst of a fertile plain, and in coming from seaward has a pleasant appearance; it is not a place of much trade, but it is increasing, Whale ships find it useful for watering and refreshing their crews. Fresh provisions, vegetables, and fruit are abundant, and on reasonable terms; wood is also plentful, and a stream of fresh water runs down the side of the cliff into the sea. Landing is tolerably good, a camber affording protection for boats; yet rafting seems to be the best method of watering.

In coming from seaward, the best distinguishing marks for this place are the *Beagle Mountains*, three in number in the rear range, 4,000 ft. high, and each of which has two separate peaks. They lie directly over the bay, and, on closing the land, Mount Salinas near Bajas Point, as well as the island of *Don Martin*, to the northward, will be seen; about midway between them is the Bay of Huacho, under a light brown cliff, the top of which is covered with brushwood. To the southward the coast is a dark rocky cliff.

Carquin Bay is N.W. by N. $\frac{1}{2}$ N., $3\frac{3}{4}$ miles from Huacho. It is scarcely as large as Huacho, and apparently shoal and useless to shipping; off *Carquin Head*, which is a steep cliff, with a sharp-topped hill over it, there are some rocks above water, and an islet a short mile distant. At 3 miles N.W. by N. from Carquin Islet, is the *Island of Don Martin*, moderately high, white with guano, and round to the northward of the point, abreast of it, is the *Bay of Begueta*, no place for a vessel.

From this bay the coast is moderately high, with sandy outline, all the way to *Atahuanqui Point*, distant 8 miles N.W. by N. $\frac{1}{2}$ N. This is a steep point, with two mounds on it, and is partly white on its South side; there is a small bay on its North side, fit only for boats. Between this point and the South part of Point Thomas, the coast forms a sandy bay, low and shrubby, with the town of *Supé* about a mile from the sea.

Supe' Bay.—*Point Thomas* is similar in appearance to Atahuanqui, without the white on the South side. To the northward of this point there is a snug little bay, capable of containing four or five sail; it is called the *Bay of Supé*, and is the port of that place and of Barranca, but is not open to commerce. There is a fishing village at the South end of the bay, where refreshments may be obtained, but water is scarce. The best anchorage is in 4 fathoms, with Point Thomas shut in by Patillo Point, about a cable's length from the rocks off that point, and rather more than a quarter of a mile from the village. Good anchorage may be obtained further out in 6 or 7 fathoms, though but little

sheltered from the swell. In entering, no danger need be apprehended; Point Thomas is bold, with regular soundings, from 10 to 15 fathoms, three-quarters of a mile off it. Off Patillo Point, though there are a few rocks, yet there is no necessity of hugging the shore very closely, as you can always fetch the anchorage by keeping at a moderate distance when standing in.

To recognise this port, the best guide at a distance is *Mount Usborne*, 8,060 ft. high, the highest and most remarkable mountain in the second range; it bears from the anchorage N.E. ½ E.; it has something the shape of a bell, and has three distinct rises on its summit, the highest at the North end.

Barranca Head, 2 miles N.W. of Supé, is low, and to the North of it is a bay of the same name, useless on account of the surf. A mile N.N.W. of Barranca Head several breaking rocks lie 2 cables off shore. At 3½ miles N.W. of the head is the *River* and *Valley of Barranca* or *Pativilca*, the latter well cultivated and irrigated. The spit at the entrance is reported to be extending to the westward, and vessels should not apgroach it within 3 miles, especially in thick weather. *Mount Darwin*, or *Patavilca Peak*, rises inland, 15 miles to the northward. It is a very sharp cone, 5,800 ft. high.

From Supé the coast generally is a clay cliff, about 100 ft. in height, to Barranca River, a distance of 5 miles; it then becomes low and covered with brushwood, to the foot of Horca Hill, 6 miles farther on; here it again becomes hilly near the sea, with alternate rocky points and small sandy bays, which continue for the distance of 18 miles to *Jaguey Point* and the bay called *Gramadel.* This is a wild-looking place, with a heavy swell rolling in; but it is visited occasionally for the hair-seal, with which it abounds. There is anchorage in 6 or 7 fathoms, sandy bottom, with the bluff that forms the bay bearing S.S.E. about half a mile from the shore; landing is scarcely practicable.

The coast for 8 miles maintains its rocky character, with deep water off it, as far as the *Bufadero*, a high steep cliff, with a hill having two paps on it, 1,620 ft. high, a little in-shore. From this bluff a rocky cliff from 200 to 300 ft. high, with a more level country, extends for 14 miles, as far as Legarto Head, round which is the *Port of Guarmey.*

GUARMEY, or Huarmey.—In comparison with other places, this may be considered a tolerable harbour, having good anchorage everywhere, in from 3½ to 10 fathoms, over a fine sandy bottom.

Firewood and charcoal are the principal commodities, for which it is the best and cheapest place on the whole coast. Vessels of considerable burden touch here for these articles, which they carry up to Callao, and derive great profit from their sale. There are also some saltpetre works, but little business is done in that line. The town lies in a north-easterly direction, about 2 miles from the anchorage, but is hidden by the surrounding trees, which grow to the height of 30 ft. It has only one street, and contains about 900 inhabitants. At the anchorage there is a small house, used for transacting

business, but no other building, which is unusual, as at most of these places a small village has been established near the sea. Large stacks of wood are piled up on the beach, ready for embarkation. Fresh provisions, vegetables, and fruit, are plentiful and moderate; but water is not to be depended on.

Legarto Head is a steep cliff, with the land falling immediately inside it, and rising again to about the same height. In sailing in, after having passed the head, a small white islet will be seen in the middle of the bay; steer for it, that you may not border on the southern shore, for there are many straggling rocks running off the points; and when sufficiently far to the northward to shape a mid-channel course between this *Harbour Islet* and the point opposite to it, to the southward, do so, and it will lead to the anchorage. In standing in, in this direction, the water shoals gradually to the beach, but the southern shore must on no account be approached nearer than a quarter of a mile. The best anchorage is in 4 fathoms, with Harbour Islet bearing N.W. by N. $\frac{3}{4}$ N., and the ruins of a fort on a hill in-shore, E. $\frac{1}{2}$ N., about a quarter of a mile from the landing-place on the beach.

The rise and fall of the tides are very irregular, and the time of high water is about $6^h\ 10^m$, on full and change, but is uncertain; generally speaking, 3 ft. may be considered about the extent to which it ranges.

Culebras Cove.—At $7\frac{1}{2}$ miles N.W. by N. from the white islet at the North end of Guarmey Bay is Culebras Point, a level projecting point, similar in appearance to Legarto Head, when seen from the northward. *Culebras Cove* is to leeward of Culebras Point, and has a depth of 6 to 8 fathoms, $2\frac{1}{2}$ to 3 cables from the South shore. There are some houses, and a flagstaff in front of them. The beach is low, and boats can make a landing in the eastern corner, where the breakers are less severe. Some cotton is exported from here; the place is without resources. From that point the coast is rocky, with small sandy bays, and at 3 miles to the northward *Erizos Rocks* lie three-quarters of a mile off shore; there is also a white cliffy islet, *Cornejos Islet*, 5 miles to the northward of Culebras, from whence the coast takes a bend inwards, forming a bay terminating at *Mongoncilla Point*. A straight shore, of 10 miles in length, then extends towards *Colina Redonda*, a point with two hummocks on it, and when seen from the southward, appearing like an island. On its North side is a *Caleta*, or *Cove*, but only fit for boats, and immediately over it rises the Cerro Mongon.

Cerro Mongon, 3,900 ft. high, is the highest and most conspicuous object on this part of the coast. When seen from the westward it has a rounded appearance, though with rather a sharp summit; but from the southward it shows as a long hill with a peak at each end. The lower part is often enveloped in fog.

From Mongon a range of hills runs parallel to the coast, which is high and rocky, with some white islets lying off it, as far as *Casma*, where they ter-

minate in *Calvario Point*, a steep rocky bluff that forms the southern head of that port.

CASMA BAY is a snug anchorage, something in the form of a horseshoe; between the entrance points it is 1¾ mile wide N.W. and S.E., and 1½ mile deep from the outer part of the Cheeks, with regular soundings from 15 to 3 fathoms near the beach. The best anchorage is with the inner part of the South Cheek bearing about S.S.E. a quarter of a mile off shore, in 7 fathoms; by not going farther in you escape, in a great measure, the sudden gusts of wind that at times come down the valley with great violence. Captain Fergusson, of H.M.S. *Mersey*, mentions a rock with 9 ft. water on it, on the South side of the bay, half a mile from the shore, that sometimes breaks. Corn, cotton, firewood, and charcoal are among its rising exports. The town is 6 miles from the port. A pier was proposed.

The best distinguishing mark for Casma is the sandy beach in the bay, with the sand-hills in-shore of it, contrasting strongly with the hard, dark rocks of which the heads at the entrance are formed.

At 1⅓ mile W. by S. ½ S. from the North head, is *Negra* (or *Black*) *Rock;* it is of moderate height, and very dark. A sad event makes it memorable—the transport frigate *Mercedes*, with 800 souls on board, struck on it on a very dark night in 1854, and instantly sank. Her heroic commander, Don Juan Noel, after saving all he could, perished with 700 of her crew.

From hence the coast takes a rather more westerly direction, but continues bold and rocky. At 14 miles N.W. ¼ N. from Casma, is the great *Bay of Samanco*, or *Guambacho;* and midway between them the shore recedes into a deep bight, with the two islands of *Viuda* and *Tortuga* in front. At 3 miles beyond the bight are *Chinos Rocks*, about 2 cables off shore, and here commences another bight, 1½ mile across, with a sandy beach. The N.W. side of the latter is formed by *Samanco Point*. *Bird Island*, nearly a mile off the N.E. coast of the bay, is covered with white guano patches, and rocks extend 2 cables westward of it. *Lobo* or *Seal Island* forms the N.W. limit of entrance to Samanco Bay. It is 2 cables from the shore, and bears the same appearance as the coast in its vicinity, dark rocks with white patches.

The BAY OF SAMANCO is the most extensive on the coast of Peru to the northward of Callao, being 6 miles in length, in a N.W. and S.E. direction, and 3 miles wide; the entrance is 2 miles across, between Samanco Head on the South and Seal Island on the North, and there are regular soundings all over the bay.

At the S.E. corner, in a sandy bay, stands a small village (the residence of some fishermen), at the termination of the River Nepeña. This river, like most others on the coast, has not sufficient strength to force a passage for itself through the beach, but terminates in a lagoon within a few yards of the sea.

The town of *Guambacho* is about 3 miles distant, at the eastern extremity of

the valley; and Nepeña, which is the principal town, lies about 15 miles to the N.E. There is very little trade at this place. Refreshments may be obtained from the neighbouring towns. Firewood, charcoal, rice, and cotton are exported. The water of the river is brackish and unfit for use, but there are wells on the left bank, a short distance from the huts. When taken on board this water is not good; but, contrary to the general rule, after it has been some time confined, it becomes wholesome and pleasant tasted. It is high water, on full and change, at $6^h\ 30^m$; springs rise 2 feet.

When at a distance, the best mark to distinguish this bay is *Mount Division*, a hill 1,880 ft. high, with three sharp peaks, rising from the peninsula between Samanco and the Bay of Ferrol. There is also a bell-shaped hill on the South side of the bay that shows very distinctly. *Mount Tortuga*, a short distance inland to the eastward, will also be seen; it is higher, and similar in appearance to the Bell Mount. N.W. of Mount Division are *Ferrol Islands*, three moderately high islands in a line, and 1⅓ mile farther North, with North Ferrol Island between, is *Blanca Island*, very close to the North shore of Ferrol Bay.

Samanco Head, the South point of the bay, is a steep bluff, with some rocks lying a cable off it. On opening the bay, Leading Bluff will be seen, a large mass of rock on the sandy beach at the N.E. side, that looks like an island. In going in, give Samanco Head a berth in passing; you may then stand in as close as convenient to the weather shore, and anchor off the village in 4, 5, or 6 fathoms, sandy bottom. When rounding the inner points take care of your small spars, for the wind comes off the Bell Mount in sudden and variable puffs.

CHIMBOTE.—At 9 miles from Samanco, and separated from it by a low sandy isthmus, is *Ferrol Bay*, 7 miles long and 4 miles deep, in the N.E. corner of which, between Blanca Island and the main, is Port Chimbote.

The railway, of which 52 miles were completed in 1877, is to be 172 miles in length, and to extend to the mining district of Recuay. It passes up the valley of Santa, then southward along the highlands, and is designed to open up the rich mines of the Ancache province, and encourage the growth of cotton, rice, coffee, cocoa, &c. Telegraphic communication exists with Lima, &c.

The town, of quite a recent growth, stands on the shore, opposite Blanca Island, and has on its seaward side the remains of the old Indian village. Chimbote is now a port of call for the P.S.N. Company's vessels. A pier was constructing, to be 1,640 ft. long, and supplied with derricks.

Supplies.—Beef and mutton are as cheap as at Callao; vegetables and fruits scarce and dear. Ships' stores moderate in price. *Water* is brought from Coisca Bay by lighters; it costs about 2 cents a gallon, and is as good as Callao water.

Directions.—To the southward of Blanca are the *Ferrol Islands*, the passage

between the northernmost of which and Blanca, 1¼ mile wide, is clear of danger, with plenty of water close to both islands. It is the *main* entrance. The passage between northern and middle Ferrol Islands, half a mile wide, is suitable for steamers but not for sailing vessels, on account of the swell. The passages to the southward of this should not be used.

The northern passage, 1½ cable wide between Blanca Island and Chimbote Point, is used by the P.S.N. Company's steamers, but the swell would make it dangerous for sailing vessels.

Blanca Rocks, the only hidden danger, which break sometimes, extend half a mile westward of Blanca Island.

There is good anchorage in 4¾ to 5 fathoms, sand and mud, near the mole, which should be steered for on entering. During full and change a swell sets in through the main passage, making it rough at the mole for landing, but never dangerous for vessels at anchor. It is high water, on full and change, at $5^h\ 50^m$; springs rise 2 feet.

As the prevailing winds and currents are from the southward, vessels should make the land to the southward of the port, and avoid falling to leeward. The prominent marks near are Bell Mount and Mount Tortuga, in Samanco Bay, before described; Mount Division, between Samanco and Ferrol; Mount Chimbote, Santa Island and Santa Head to the northward.

Santa Island, 6 miles N.W. from the entrance of Ferrol, is 1½ mile in length N.N.E. and S.S.W., and of a very white colour; just without it are two sharp-pointed rocks, 20 ft. above the sea. Inside Santa Island is *Coisca Bay*, having anchorage opposite the fishing village, in its S.E. part, in 5 or 6 fathoms. Landing is difficult.

Santa Bay.—At 2 miles N.N.E. from Santa Island *Santa Head* make as an island, and forms the South side of the bay of that name, which, although small, is a tolerable port; the best anchorage is in 4 or 5 fathoms, with the N.W. extreme of the head bearing S.W. Care must be taken in entering to avoid a rock which lies a cable off Santa Head, and seldom breaks. Fresh provisions and vegetables may be obtained on moderate terms. It is also a tolerable place for watering, and has an improving trade in cotton, rice, &c. No danger exists in entering; the soundings are regular for some distance outside, and you may anchor anywhere between the island and the main, in a moderate depth of water, but of course exposed to the swell.

The town lies about 2 miles East of the anchorage, and the mouth of *Santa River* 1½ mile North of it. This is the largest and most rapid river on the coast of Peru; but at its termination it has only sufficient strength to make a narrow outlet through the sandy beach.

This part of the coast may be known by the wide-spreading valley through which the river runs, bounded on each side by ranges of sharp-topped hills. It is one of the most fertile valleys in Peru; and as you approach, Santa Island will be plainly seen, with the head of the same name; there is also a

small but remarkable white island, called *Corcovado*, 3½ miles to the N.W. of the harbour, and 3 miles off the coast. About half a mile N.W. of it is a cluster of rocks on which the sea usually breaks.

Viuda Island, a mile off shore, lies 3 miles N.N.W. of Corcovado Island; and 3½ miles from Viuda Island, to the N.W. ½ N., and 2 miles off shore, is a low breaking rock with deep water all round it.

Chao Islands.—At 15 miles N.W. ½ N. from Santa Bay, lie Chao Islands, 1¾ mile off the point and hill of that name. The largest is a mile in circumference, about 120 ft. high, and, like most of the islands, quite white. Between Santa and Chao the coast is a low sandy beach, which continues and forms a shallow bay, as far as the Hill of Guañape, with moderately high land a few miles in-shore.

Chao Cove.—To northward of Chao Point the coast bends slightly inwards, and so continues for 4 miles to a small high point, North of which lies Chao Cove. *Chao River*, in the depth of the bight, 7 miles North of Chao Point, has anchorage off it for coasters. It runs through the valley of the same name, in which are large forests of the carob tree, which furnishes the best firewood. *Virú River*, with very little water, is 11½ miles to the N.W.

GUANAPE ISLANDS consist of a high island with several islets and rocks, or farallones, scattered about within a circumference of 3 miles. The nearest to the main land are 5½ miles S. by W. from Guañape Hill, and 16 miles N.W. ½ W. from Chao Point. The high island is the southernmost, and rises 492 ft. above the level of the sea. The side facing the westward is very steep-to, and presents a surface of dark rocks with a sharp summit. The northern islets are low, and sprinkled with white patches of guano. They form a good mark for vessels bound to Huanchaco, and were surveyed by Mr. LeClere in 1873.

These islands were explored and found to contain a considerable quantity of guano of excellent quality, and the government constructed extensive works with the object of facilitating the loading of this article. Vessels obtain permission to load at Callao, and can clear at Payta, or at Callao.*

There is good and safe anchorage on the N.E. side of both islands. The best anchorage is a quarter of a mile off the N.E. extremity of the northern, in 11 fathoms, sand and mud, or vessels can moor alongside the coast to load guano. Landing also is easiest on the northern of the islands. On the southern island is the governor's house, a coastguard station, and some troops. Fresh provisions and water are easily obtained, the former at a moderate price. The climate is good and temperate. Fish, birds, and seals are abundant.

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* In May, 1870, 1,200 tons of guano a day were shipped from the South island, and it was estimated that at this rate the whole would be exhausted in eighteen months. On the North island the shipment amounted to 700 tons a day; at which rate the guano would last for eight months.

The large rocks N.W. of the North island are called *Sea Lion Rocks*, and are without off-lying danger, but vessels should not pass between these and the island, as *Goddard Shoal*, of 3 ft., lies 1 cable N.W. by N. ¼ N. from the small islet in the centre of the passage. It should be avoided by boats, as the sea rises or breaks over it suddenly, and when least expected.

During night, or fogs which are frequent here from January to April, careful allowance should be made for the current, as the Guañape Islands may be passed without seeing them. Although generally setting to the north-eastward, no doubt it varies frequently, and sets to the southward.

Guanape Cove is situated on the northern side of Guañape Hill, penetrating a little to the eastward. The best anchorage is in front of some huts on a low beach leading from the hill, one-third of a mile off. Heavy swells set in frequently, so that landing in ships' boats is imprudent. Launches are employed in loading the cotton, fire-wood, and other products of the neighbouring estates.

From the Hill of Guañape the coast continues N.N.W. for 13 miles, a sandy beach with regular soundings, and ranges of high sharp-topped hills, over 4,000 feet high, about 6 miles from the sea, till near the little *Hill of Carretas*, 350 feet high, which is on the beach, with the sharp peaks of the *Morro de Garita*, 3,720 ft. high, overlooking it to the N.N.E. Carretas Hill has a signal-staff on its summit.

PORT SALAVERRY, midway between Guañape Cove and Huanchaco, is immediately North of Carretas Hill, and has risen to some importance since the building of the railway to Truxillo, 7½ miles distant, and thence through the fertile valleys of Chicama and Chima, terminating at Ascope. Sugar is grown in the valleys, and forms the principal article of export. The ports of Huanchaco and Malabrigo, having no railway, have proportionately declined. There is *telegraphic* communication with Lima, &c. Provisions and water are scarce, the latter having to be brought from Truxillo.

The best anchorage is in 6 to 7 fathoms, sand and mud, with Carretas Hill bearing between East and E.N.E., half to three-quarters of a mile off shore. Vessels lie at single anchor, and should be prepared for slipping and making sail. It is advisable not to anchor nearer to the shore than half a mile. The breakers commence some distance from the beach on account of the tasca, it is therefore not prudent to attempt landing in ships' boats, but with native aid a more convenient landing is made than at Huanchaco. A red flag is shown when cargo can be landed on the beach; when the mole reaching beyond the breakers is completed, the port can be frequented in safety.

Light.—A *fixed bright* light, elevated 148 ft., and visible 4 miles, is shown from an iron stage on the western side of Carretas Hill.

Approaching Salaverry from the southward, it is advisable to make Guañape Islands, after passing which the coast may be closed to a depth of 8 fathoms;

the lead is of great use upon this gradually-shoaling coast, for the fogs frequently last for days. Care must be taken not to be carried to the N.W. of the port by the current, or many days would be lost in beating up perhaps only a few miles. From the northward, Huanchaco Peak and Mount Campana, hereafter described, are good marks, and when closer in, the town of Truxillo is seen; also a large white house about a mile inland, 4 miles North of Salaverry.

TRUXILLO.—Here commences the *Valley of Chima*, about the middle of which stands the *City of Truxillo*, the white spires of which town are seen from sea, and 5 miles farther North are the village and Road of Huanchaco. The city of Truxillo is said to contain 6,500 inhabitants. It was founded in 1535 by Pizarro, who gave it the name of his native city in old Spain. The houses are low, in consequence of the earthquakes, and in its neighbourhood are the ruins of several ancient Peruvian monuments. Cotton, rice, barley, chancaca, and bar-silver are among the articles exported.

The ROAD of HUANCHACO is on the North side of a few rocks that run out from a cliffy projection, sheltering the beach in a slight degree, but affording no protection to shipping. It lies between the low beach to the southward, and the bold earth cliffs of moderate height near the sea which continue to the northward. It has bad anchorage in from 5 to 7 fathoms, at a mile off the land. There is no shelter from the continual cross sea, and when a heavy swell sets in the breakers commence far outside. The town, not very conspicuous, is on a small plain, under the cliff; the church is on the rising ground, and being painted white is very conspicuous afar off, and is the best mark for making the place.

The best anchorage is gained by passing to 1 mile from the southern side of the port; then steer for a patch or opening of red earth on the cliffs to leeward. Keep on at the same distance until you can see the light through the front and back windows of the spire, and when these begin to hide themselves, let go a good anchor with at least 60 fathoms of chain. This spot is called *El Pozo*, and is the safest place in the roadstead. Nearer the land you are within reach of the heavy sea which beats on the weather shore, where there are besides scattered rocks which endanger the anchor.

Capt. Livingston says:—"The best anchorage is in 7 fathoms, about 1½ or 2 miles off shore, with the belfry of the church open, or in one with the only palm tree in the village of Huanchaco. The ground is very foul, and there are few vessels which do not lose one or more anchors. A vessel should always come-to with a very light anchor, and a long scope of chain, and sight it every day."

It is not prudent to land in the ship's boats, even in fine weather. The launches of the place will immediately come off when it is possible to do so.

They are manned by nine men, well skilled in crossing the *tasca*, or span, between the rollers and the surf.*

If bound for this road you should stand in on the parallel of 8° 7′ (which is a mile to windward), and you will see *Mount Campana*, a bell-shaped mount, standing alone, about 7 miles to the northward, and *Huanchaco Peak*, which is very sharp, and the first hill in the range on the North side of the valley. Shortly after the church will come in sight, and the shipping in the road. Keep close in with the land at sunset, as the wind then draws off shore.

"The winds on this coast," says Capt. Livingston, "are almost always from the southward, though there are instances to the contrary. The current also generally, though not always, sets to the northward. The swell is reckoned always to be heaviest at the full and change of the moon, but, during the seven weeks we lay in Huanchaco Roads, I thought the heaviest swell was generally at the quarters of the moon."

The *Peak* of Huanchaco is a very sharp conical hill, 6 miles inland, and very plainly seen from a distance. The *Cerro de la Campana* (bell mount), 6 miles North of the port and 5 miles inland, is the most remarkable land on this coast. It derives its name from its resemblance to a bell, and is surmounted by some rocks which are like the crown by which the bell is hung. It is 3,450 ft. high, and cannot be mistaken. The upper part is frequently enveloped in haze, which leaves the base and summit clear.

From Huanchaco the coast runs to N.W. by W. for the first few miles, consisting of nearly perpendicular earth cliffs, leaving but a very narrow beach, and succeeded by a low sandy coast. At 14 miles is the pleasant valley of *Chicama*, through which runs the river of that name during the first months of the year.

Brujo, or *San Bartolomé*.—At 3 miles beyond the Chicama Valley is a cove in front of a village, built on the rising ground, called *Magdalena de Cao*. This cove has been opened as a shipping place for the produce of the neigh-

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* "Landing here is always bad, and often impracticable. No stranger ought to attempt it without having *cholos* (natives) in the boat; and it generally is advisable to employ the launches kept at the place; several persons were drowned about the time I was there. The Indians will, however, come off to ships in the very worst weather, on what they call *caballitos*, which are merely bundles of a kind of triangular bulrush, called *totora*. The *caballito* is generally formed of two bundles, but some large ones are of three bundles of *totora*. Some carry two men, and others only one. Their paddles are about 6 feet long, and are merely the half of a split bamboo. With a heavy swell the Indians are frequently washed off the *caballitos*, but never fail to regain them. They are admirable swimmers, the children seem almost amphibious. They do not swim like persons in England, but paddle with their arms like a dog with his fore feet in swimming. The Indians do not generally sit astride on the *caballitos*, but generally with both their legs straight out on the top."—*Capt. Livingston.*

bourhood, but the anchorage is rocky, very bad, and without the slightest shelter.

From Chicama the coast continues of the same character for 12 miles, when it trends to the westward, terminating in the *Cerro de Malabrigo*, which is 790 feet high. It stands on a projecting point, and at a distance appears like an island.

MACABI ISLANDS.—These two islands, separated by a channel 40 yards wide, lie S. ½ W., 6 miles from Malabrigo Point, with a safe passage of 10 fathoms inside them, and 12 to 20 fathoms within 1½ cable outside them. The *North Island*, with some patches of guano, is about 100 ft. high. The best anchorage is off the N.E. part of the island in 9 to 18 fathoms, sand, half a cable from the North point, on account of the heavy swell from the South and S.W. There are no dangers round this island. The *South Island*, of middle height, is entirely covered with guano, and presents a bronze or dark yellow colour, with several large rocks close to the shore. There is neither anchorage nor shelter near this island.

Vessels visiting Macabi Islands for the purpose of loading guano should always approach from the eastward, and when about 1 mile off steer for them until the channel between the islands is open, keeping both anchors ready, which let go as soon as the channel is closed. Fresh provisions are brought from Malabrigo. During the day the wind blows generally from South to S.S.E., and during the night from S.E. to East. Calms are rare, but fogs occur from December to April.

MALABRIGO ROAD.—This bay, although badly sheltered and shallow, is considerably preferable to Huanchaco; it is formed by the cluster of hills, projecting beyond the general trend of the coast, forming Malabrigo Point and Hill, which at a distance appears like an island; there is a village at the S.E. side. Several improvements are proposed here. A mole is to be constructed, and a railway is to extend 20 or 25 miles inland to Ascape and Paijan, passing through the rice and sugar estates of the Chicama Valley. Telegraphic communication already exists with Lima, &c. The town of *Paijan* lies some leagues to the S.E., and is of considerable extent.

A rocky shoal was discovered in the road, near the usual anchorage, by Commander E. Nares, in 1869. *Garcia Rock* is the shoalest part of this rocky patch, which is about 2 cables in extent, consisting of pinnacles with sand between. The least water found was 12 ft., with 14 and 18 ft. on other parts of the shoal. The 12-ft. rock is a little more than half a mile from the shore, with the extreme of Malabrigo Point bearing S.W. ½ S.; Observation Point (which may be known by the black rocks off it), S. by W.; and a white cross westward of the village, S.E. ¼ E.

Vessels may anchor in the road in 4 fathoms, with the centre of the village E.S.E. about three-quarters of a mile, and avoiding the rocky ground by not bringing Observation Point westward of S. ¼ E. Landing is bad.

The wind blows very fresh with heavy gusts here, from noon to sunset, and the upper sails should be taken in immediately on rounding the point. The village will probably not afford any refreshments, and vessels can only load during the flood tide, as the water is too shoal for launches.

Arcana or Puemac Point, 12½ miles N.W. ½ N. of Malabrigo, projects but slightly, and may be known by a number of wooden crosses standing on it. The point should not be approached within a mile.

PACASMAYO ROAD lies N.W. by N., 20 miles from Malabrigo. The coast between is low and cliffy, with a sandy beach at the foot of the cliff, and soundings of 10 fathoms 2 miles off shore. Pacasmayo is a tolerably good roadstead, under a projecting sandy point, with a flat running off it, to the distance of a quarter of a mile. The best anchorage is with the point bearing about S. by E., and the village East, in 5 fathoms, sand and mud. There is no danger in standing in; the soundings are regular, shoaling gradually towards the shore. A pier about 1,000 yards long, including the pier-head 330 ft. long and 150 ft. wide, extends W. ¾ S. from the North side of Pacasmayo River, with 4¼ fathoms water at the outer end. The principal export is rice, which is brought from the town of San Pedro de Yoco, 6 miles inland. Fresh provisions may also be obtained from the same place; wood and water may be had at the village on the beach, which is principally inhabited by Indians employed by the merchants of San Pedro, but all supplies are scarce. Telegraphic communication exists with Lima, &c., and steamers call here regularly.

Lights.—Two *fixed* lights, 5 ft. apart horizontally, one *red* and the other *bright*, are shown from the flagstaff on the end of the mole; they are elevated 65 ft. above the sea, and should be visible 3 miles.

The *railway* from Pacasmayo to Magdalena, 93 miles long, which is partly finished, is to be extended across the Andes to Caxamarca. It starts from the iron mole half a mile long, at Pacasmayo, thence passing up the Jequetepeque Valley, cultivated with sugar-cane and corn.

To distinguish this road from seaward, the best guide is to stand in on the parallel of 7° 25′ to 30′, and when within 18 miles, the Hill of Malabrigo will be seen, like an island sloping gradually on each side; and a little to the northward, Arcana Hill, apparently rugged with sharp peaks, the point being marked with the wooden crosses before-mentioned. As you approach, the low yellow cliffs will appear (those North of the road the highest), on the summit of which, on the North side of the point, there is a dark square building that shows very distinctly. The best mark for the anchorage is the shipping when any are there.*

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* Pacasmayo is the port for the celebrated Guadalupe fair, which is held during the first nine days of December at Guadalupe, 15 miles distant. The fair is attended by above 15,000 people from all parts of the Republic, and transactions amounting to nearly 1,000,000 of dollars are made.

Jequetepeque River, which flows through the cultivated valley of the same name, enters the sea at 4 miles N.W. by N. of Pacasmayo; it is almost dry at the end of the year. *Sana Point* projects considerably, and can be plainly seen from Pacasmayo, from which it is distant 15 miles. Several rocks extend N.W. 3 cables from the point, on which the sea always breaks. *Antarctique Rock*, on which the French steamer of that name was wrecked in November, 1882, is stated to have 16 ft. on it at low water, and to lie with Sana Point bearing E. $\frac{3}{4}$ S. distant $5\frac{3}{4}$ cables. The wreck lies in $7\frac{1}{2}$ fathoms, with the point bearing E. by N. $\frac{1}{2}$ N., distant 7 cables.

Cherrepe Cove.—North of Sana Point the coast curves slightly and forms the *Caleta de Cherrepe*. There is tolerable anchorage one-third of a mile off shore in from 5 to 7 fathoms, but a heavy swell frequently sets in. The only signs of life here are some storehouses on the beach, from which sugar is shipped.

From Sana Point the coast continues low, with broken cliffs, 18 miles N.W. to Eten Point. *Progreso Creek*, 11 miles from Sana Point, is opened for the exportation of wood, coal, &c., by vessels chartered for this purpose. It has no resources. The anchorage is without shelter, one mile off shore, and landing is difficult

ETEN POINT is a double hill (the southern one, 640 ft., the highest) with a steep cliff facing the sea. The North side of this cliff is white, and shows very conspicuously. Inland at 7 and 14 miles distance are two peaks respectively 1,900 and 2,450 ft. above the sea. There is *anchorage* in from 5 to 6 fathoms, gravel, $1\frac{1}{4}$ mile N.W. by W. of the point, with the flagstaff bearing N.E. by E.

A railway, 50 miles long, connects Eten with Monsefu, Chiclayo, Lambayeque, and Ferreñafe. The new harbour has greater advantages than those of Pimentel and San José, the ports of Chiclayo and Lambayeque, on account of its greater depth nearer in-shore, the smaller extent of the tasca and breakers, and the shelter which the bluff and point affords to the iron mole, which is stated to be nearly 1,800 yards long. The town, 2 miles to the N.E. of the port, is increasing rapidly; fresh provisions are abundant, and water is conducted to the mole. A flagstaff fixed on a white pyramid serves at present as a guide to those not acquainted with this part of the coast, and during the night, a *fixed bright light*, elevated 65 ft. and visible 3 miles, is exhibited from the flagstaff on the end of the mole. In 1876, 167 vessels, with a total tonnage of 135,360, entered this port.

The coast to the north-westward of Eten is very peculiar. For 85 miles it is formed of a very low sandy beach, on which the surf beats so heavily that the breakers sometimes extend a mile off shore, and then may be heard 8 or 10 miles off. There are regular soundings not exceeding 50 fathoms as far as Lobos de Afuera, and 6 or 7 fathoms at 3 miles from the beach.

Caleta de Pimentel is $7\frac{1}{2}$ miles N.W. of Eten Point. It is a most incon-

venient anchorage, although the steamers touch here occasionally, but the opportunities for loading are rare. Some cane warehouses were built, and other buildings may be seen on the hills. A railway, 45 miles long, extends from Pimentel to Chiclayo, with a branch to the town of Lambayeque.

LAMBAYEQUE ROAD.—About 12 miles N.W. ½ N. from Eten Point, is the road of San José de Lambayeque, one of the worst anchorages on the coast of Peru. It lies at a point of the long sandy beach, when it changes its direction, and is simply an open roadstead. In approaching it, it is best to make out Eten Point, and then keep 3 or 4 miles off shore till the houses are recognized.

The village of San José, on the beach, consists of straw and cane huts and stores, which are nearly of the same colour as the beach itself; but the church, which has a small tower and the pantheon or burial place, are both painted white, and these are more conspicuous; the latter standing on a hill North of the village, has a green door facing the sea. As soon as the church tower bears E. by N. ½ N., 2½ to 3 miles distant, let go your best anchor in from 6 to 7 fathoms, with at least 70 fathoms of chain. It is bad holding-ground, and a constant and disagreeable swell from the S.W., so that on the approach of bad weather it may become necessary to slip your cable. Communication with the shore is very frequently impossible for several days.

The village is much troubled with the sand from the surrounding hills, but has a considerable trade. The towns of Chiclayo, 7 miles distant, and Lambayeque, 6 miles off, furnish abundance of fresh provisions; water is not to be procured. Tobacco, sugar, cotton, rum, rice, &c., are exported. The only method of discharging or taking in a cargo (or in fact landing at all) is by means of the *balsa*, a raft of nine logs of the cabbage-palm, secured together by lashings, with a platform raised about 2 ft., on which the goods are placed.

Lambayeque River entrance is 8 miles N.W. by W. of San José; except from January to May it has but very little water.

The coast continues low and sandy, similar in appearance to that of Lambayeque, for the distance of 75 miles W.N.W. It is the limit of the Sechura desert, which extends 120 miles North and South, and is quite without vegetation. An extensive range of table-land of considerable height, with broken rocky points, then commences, and continues to Point Aguja, or the Needle.

LOBOS DE AFUERA.—At 45 miles W.S.W. from Lambayeque, lies a small group of islands, called Lobos de Afuera or outer Seal Rocks. It consists of two principal islands, separated by a channel, 1¼ cable long, in a N.E. and S.W. direction, 120 ft. wide and 4 fathoms deep.* They are about 2½ miles

* A minute survey of the island was made in 1852, by Capt. Don Ramon Valle-Riestra, which enabled D. A. Garcia to draw up the above description; and a chart by Captain

long North and South, and 1½ mile broad, with a large number of islets and rocks around them. They are about 100 ft. high, of a mixed brown and white colour, being covered with *guano* from the sea-birds which come here from October to April. At the S.W. end a shoal stretches a cable off the coast, and close to the N.E. end there is a shoal on which the Peruvian brig *Manuel* was lost.

There are several landing places, one of which, called by the fishermen the *puerto grande*, is on the eastern side. The southern island has a chain of islets extending to the N.W. nearly 6 cables from its northern point, and the outer islet of the northern island lies N. by W. 2½ cables from its North point. Between these outer islets is the entrance to the northern and chief anchorage, 1 mile across. In the middle of the entrance, but slightly on the eastern side just within the points, is a very dangerous shoal of 8 ft. least water, and 150 ft. wide. The anchorage is at the head of the cove, which is about 1 mile deep, in 8 to 20 fathoms, sand, just westward of the channel which separates the islands. On the North side of the northern island is a small cove, in which is a stone landing place, built in 1852. No wood or water can be obtained.

The southern and western sides are quite inaccessible. There is no danger round the islands, at the distance of a mile; and regular soundings will be found between them and the shore, from 50 fathoms abreast of the island. A governor and a guard reside here, to prevent the guano being removed by foreign vessels. The fishermen from Lambayeque also frequent the islands for the purpose of catching and salting fish.

LOBOS DE TIERRA.—At 30 miles N.W. by N. ¾ N. from Lobos de Afuera, lies the Island of Lobos de Tierra, 10 miles off shore. It is nearly 6 miles in length, North and South, and about 2 miles wide; when seen from seaward it has a similar appearance to the former islands. It has a few low detached rocks around its shores. A safe passage is said to exist between this island and the main. The South end, from which shoal water appears to extend nearly a mile, is estimated to be from 150 to 200 feet high, and the North end from 30 to 50 feet high; there are depths of 5 and 9 fathoms within a cable of the N.E. extreme with apparently no outlying dangers. Juanchuquita Bay, on the N.E. side of the island, affords anchorage in from 6 to 10 fathoms about half a mile from the shore; Canevaro Bay, on the West side, in from 10 to 18 fathoms; and Vivero Bay, on the N.W. side, in about 7 fathoms, with the house on the South point bearing S. by E. This latter bay is said to afford the best anchorage on the West side of the island, and is the residence of the

Banner is published in the "Nautical Magazine" for February, 1874, in which the position of the guano deposits is shown. These islands have been closed to foreign trade, but there was some probability of the restriction being dropped.

Government officials; vessels entering should give Smith Island (on the south side of the bay) a wide berth, as a rock with 13 ft. water, the exact position of which has not yet been ascertained, lies about 2 cables in a northerly direction from it. Spring tides rise about 6 ft.—*Nav.-Lieut. Smith*, H.M.S. *Albatross*, 1876.

H.M.S. *Peterel*, in 1874, found fair anchorage just inside, and North of the S.E. point of the island; also good landing on a sandy beach inside the reef, where there is a small fishing establishment.

This island, like Lobos de Afuera, has a large deposit of *guano*, the exportation of which is forbidden by the laws of the republic. A guard in charge reside on the island, and are subject to the custom-house at Lambeyeque, from which place all supplies, even water, are sent. It is also resorted to by the fishermen, as fish is very abundant and easily caught.

At the termination of the low coast, to the northward of Lobos de Tierra, is the peninsula, surmounted by hills of moderate height, of which *Mount Illescas*, terminating in a very sharp peak, is the most conspicuous.

False Aguja Point, the south-western extremity of this peninsula, is low and has nothing remarkable. It is 5 miles S. by E. of Aguja Point.

AGUJA POINT is long and level, terminating in a steep bluff, 150 ft. high, and has a finger-rock (Aguja or Needle Rock) a short distance off it, with several detached rocks round the point.

At 3½ miles N. by E. ½ E. of this is *Nonura Point*, and 5 miles further in a N.E. by N. direction is *Pisura Point*, the South point of the Bay of Sechura; between Aguja Point and Pisura Point there are two small bays, where anchorage might be obtained if required. The land about this part of the coast is much higher, and has deeper water off it than either to the North or South, and may be known by its regularity and table-top.

SECHURA BAY is 36 miles wide, from Pisura Point to Foca Island, bearing N.N.W., and is 15 miles deep; on the S.E. side, the coast shows low sandhills, but as it curves round to the northward it becomes cliffy and considerably higher. Near the head of the bay is the anchorage called *La Salina*, off a few huts and salt heaps on the beach. There is anchorage before these in from 5 to 7 fathoms, 3 miles off shore. A flat extends off nearly that distance.

Sechura.—Near the centre of the bay is the entrance to the *River Piura*, and the town of Sechura, 4 miles inland, is situated on its banks. The town is inhabited chiefly by Indians, who carry on a considerable trade in salt, which they take to Payta on their balsas, and sell to the shipping. The river is small, but of sufficient size to admit the balsas when laden. There is anchorage anywhere off the river, in from 12 to 5 fathoms, coarse sand; the latter depth being more than a mile from the shore. This place may easily be distinguished by Sechura church, which has two high steeples, and shows conspicuously above the surrounding sandhills; one of these steeples has a considerable inclination

to the northward, which, at a distance, gives it more the appearance of a tree than of a stone building.

From Foca Point the coast is cliffy, about 120 ft. high, and continues so as far as *Payta Point*, which is 9 miles distant N. ¼ E.; between them, and 1½ mile from the coast, is a cluster of hills called the Saddle of Payta, 1,300 ft. high, thus described by Capt. Basil Hall:—"The Silla or Saddle of Payta is sufficiently remarkable: it is high and peaked, forming three clusters of peaks joined together at the base, the middle being the highest: the two northern ones are of a dark brown colour; the southern is the lowest, and of a lighter brown. These peaks rise out of a level plain, and are an excellent guide to vessels bound for the Port of Payta from the southward."

PORT PAYTA, eastward of Payta Point, is, without exception, the best open port on the coast. The town is built on the slope and at the foot of the hill, on the S.E. side of the bay; at a distance it is scarcely visible, the houses being of the same colour with the surrounding cliff. It is the seaport of the province of Piura. The city of San Miguel de Piura, the first city founded by Pizarro, stands on the banks of the River Piura, in an easterly direction from Payta, and about 30 miles distant. Although in the desert, and most subject to earthquakes, it has a population of about 10,000.

A Railway, 63 miles long, connects Port Payta with San Miguel and the Piura Valley. It opens up several rich cotton estates, and ultimately is to be extended across the Andes to Limon on the Marañon River. Another railway extends to La Huaca, a town about 30 miles to the northward, which is the principal means of supplying Payta with wood and water. There is a *telegraph* station here.

Fresh provisions, such as goats, poultry, potatoes, camotes, yams, and Indian corn, may be had at Payta on reasonable terms, but neither wood nor water, except at a high price, the latter being fetched from Colan, 6 miles to the northward. An aqueduct was in course of construction; when completed, it will supply the town constantly with water; coal is supplied for steam vessels at the rate of £4 the ton. Sea-fish of delicious flavour is caught in great variety and abundance. In 1876, 139 vessels visited here, with a total tonnage of 100,229. Cotton, grain, bark, and hides are the principal exports. The Panama Mail Steamers call here.

There is no danger in entering this excellent port. After rounding the outer point, which has a signal station on its ridge, you will open False Bay. This must be passed, as the true bay is round Inner Point. That point ought not to be hugged closely, for there are some rocks at the distance of a cable's length, and the wind baffles often. After rounding Inner Point, you may anchor where convenient, in quiet still water, with from 10 to 7 fathoms, over a muddy bottom. The holding ground is excellent, and notwithstanding the fresh breezes, there is nothing to apprehend. These are constant every day, setting off the land from 10 a.m. to sunset, but they raise no swell, as they

blow over the high land. In entering the roadstead it is better to shorten sail before rounding the Signal Point, as heavy gusts sometimes occur in Tierra Colorada Bay, as well as off that point. It is seldom that the anchorage is reached in one tack, but there is plenty of room for working. There are two landing piers, but care should be taken in approaching the largest, as the remains of a vessel which was burnt are to be seen in front of it.

When leaving Payta for the southward at night time, care must be taken not to mistake Rocky Point for Foca Island, as they are then much alike, the black rocks of the point relieved by the sandy bay on each side, showing at that time precisely like an island, and should the course be then altered for Aguja Point, it would most likely lead amongst the rocks and foul ground to the northward of the island before the mistake was found out.—*Commander Wood, R.N.*

The *Chira River* and Valley open to the northward of the town of Colan. The river runs over a very low beach between the cliffs which form the entrance to the valley. The river has plenty of water in the summer, and the valley is very fertile. Large quantities of cotton have been grown on it.

PARINA POINT, 27 miles N.W. ¼ N. from Payta, rises to a bluff about 80 ft. high, with a reef extending out half a mile on its West side; between this point and Payta the coast is low and sandy, with table-land of a moderate height at a short distance from the beach, and the Mountains of Amatape (3,000 to 4,000 ft. high,) 15 miles in the interior. These are also called *Brea Mountains*, as large quantities of pitch (*brea*) are obtained on them. After rounding Pariña Point (which is the western extreme of South America) the coast trends abruptly to the northward, and becomes higher and more cliffy in approaching Talara Point, 12 miles distant.

The steamer *Valparaiso* struck on the reef off Parinas Point, and remained for two days, owing her safety to the fact of her having her fore-foot on a small sandy spot between the rocks.

CAPE BLANCO, 24 miles North of Pariña Point, is high and bold (apparently the angle of a long range of table-land), sloping gradually toward the sea. Near its extremity there are two sharp hillocks, and midway between them and the commencement of the table-land is another rise with a sharp top. There are some rocks that show themselves about a quarter of a mile off, but no danger exists outside that distance.

This cape is noted for the strong breezes which are constant here, not exceeding, however, a double-reefed topsail breeze. They never come on in squalls, but increase gradually from noon to sunset.

At 6 miles North of Cape Blanco, and very near to the shore, there is a lofty cliff, the seaward face of which resembles a row of organ pipes, and it is thus called the *Cerros de los Organos*. At 4 miles North of this is the Caleta, or Cove of *Mancora*, to leeward of a small point. There is tolerable anchorage in it in from 4 to 6 fathoms at 1½ cable off shore. There are some cane and

reed huts on the shore, and large piles of carob wood, in which there is a considerable trade with Callao.

From Cape Blanco the general trend of the coast is more easterly, in nearly a direct line to Malpelo Point, which is 66 miles distant. At 22 miles N.E. by N. from the former, is *Sal Point*, a brown cliff, 120 ft. high; the coast between is a sandy beach, with high cliffs as far as the Valley of Mancora, 7 miles N.E. of Mancora Cove, where it is low, with brushwood near the sea; the hills being at a distance inland.

Northward of Sal Point the coast is cliffy, to about midway between it and Picos Point; it then becomes lower and similar to Mancora.

Picos Point is a sloping bluff, with a sandy beach outside of it, and another very similar point a little to the northward; behind there is a cluster of hills with sharp peaks, 710 ft. high, from whence arises probably the name given by the Spaniards to the point. From Picos Point the coast is a sandy beach, with a mixture of hill and cliff of a light brown colour, and well wooded. There are several small bays between it and Malpelo Point, which bears N.E. ½ N., 24 miles distant. One of these is 4⅓ miles N.E. of Picos Point, and is called the *Caleta de Boca de Pan;* it has good anchorage close to the land in from 4 to 7 fathoms. The beach is sandy and easy for landing. There are several huts and store-houses for the orchilla weed from the Mancora estate; wood is also shipped here. At 6 miles farther, is another cove called *Malpaso*, where is the chief establishment for shipping orchilla from the Mancora estate. The cove is surrounded by a steep cliff, and on a ledge about halfway up are a number of store-houses and huts. Below these huts a *coal mine* was commenced, which promised good results. Petroleum is also found here, and is being extensively worked.

MALPELO POINT forms the southern side of the entrance of Guayaquil River, and may be readily known by the marked difference between it and the coast to the southward. It is low, shoal for 2 miles to seaward, and covered with bushes; a short distance inshore there is a clump of bushes more conspicuous than the rest, which shows plainly on approaching. At the extremity of the point the River Tumbez issues, and a reef extends to the distance of a quarter of a mile from the entrance, where they fill their boats from alongside; great care is necessary in crossing the bar, as a dangerous surf beats over it, and renders that operation at all times difficult.

RIO TUMBEZ is, in some measure, classic ground, for here, in 1526, Pizarro landed with the Spanish army destined to conquer Peru. According to the Spanish accounts there was a temple of the sun, an Inca's palace, and other edifices, at the town of Tumbez, the remains of which are now nowhere to be seen.

The best anchorage is at the head of the Bay of Tumbez, 3 miles from Malpelo Point, and a mile off shore, in 5½ to 6 fathoms, with the river entrance bearing S. by E. This place is called *El Pozo*, and is good holding ground.

The river is very shallow in some parts, but navigable up to Tumbez, 6 miles up it. To avoid the delay made by the boats, passengers generally land at the quintas on the western bank, and go on by horseback. Watering is easy by towing the casks for 1½ or 2 miles up the stream. This convenience, and the abundant supply of sweet potatoes and green vegetables, make it the most frequented port on the Pacific coast by whaling vessels. Large quantities of orchilla, carob, and mangrove wood are also shipped here. Alligators abound.

The entrance to the river may be distinguished by a hut on the port hand going in, which is perceived immediately on rounding the point. The northern branch of this river is the boundary between Peru and the State of Ecuador.*

The prevailing winds on the shores of Peru blow from S.S.E. to S.W., seldom stronger than a fresh breeze, and often in certain parts of the coast scarcely sufficient to enable shipping to make a passage from one port to another. This is especially the case in the district between Cobija and Callao. Sometimes during the summer, for three or four successive days, there is not a breath of wind; the sky beautifully clear, and with a nearly vertical sun.

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* This is the termination of the excellent nautical description given in the appendix to the "Narrative of the Surveying Voyages of the *Adventure* and *Beagle*." As is well known, that most estimable officer and gentleman, the late Admiral Robert FitzRoy, made great personal sacrifices in completing the important surveys of this coast, which, for practical purposes, was the same as if he had first discovered the country. The whole of the charts were drawn by his own hand, and will ever remain a monument to his skill and perseverance.

It is also the end of the "Derrotero de la Costa del Peru," by Capt. Aurelio Garcia y Garcia. As stated previously, we have incorporated many of his remarks.

CHAPTER VII.

THE COAST OF ECUADOR AND THE UNITED STATES OF COLOMBIA, BETWEEN GUAYAQUIL AND PANAMA.

THE country whose western coast, with the exception of Guayaquil and Panama, is imperfectly described in the ensuing chapter, is one of the most important of all the South American territories; but at the same time it is one in which the vast capabilities it possesses have been least tested, and of which we are in many points most ignorant.

The Pacific coast is now the limit of the two separate and independent republics of Ecuador and Colombia, which have thus existed since 1831.

The territory called under the collective name of Colombia was the first portion of the new continent discovered by Columbus from the Atlantic side in 1498; hence its name. The Spaniards found more difficulty in establishing their sway over it than in any other portion of America; but eventually, by the middle of the sixteenth century, both the territories now known as Venezuela and Colombia were subjected to their dominion.

There are few portions of the coasts of the world which have been so commercially unimportant as the portion embraced between Guayaquil and Panama. None of its ports are resorted to by Europeans, or for European commerce; and, indeed, nearly up to the present time the whole district has remained a complete *terra incognita;* though beyond all question in future ages the fine country which bounds on the West must become of great importance. At present the few Indian and mixed breed families at the different ports accessible from the ocean constitute the sole links between it and the civilized world.

The fine surveys of our English Admiralty, conducted under the superintendence of Capt. H. Kellett and Lieut. Wood, have made us acquaintod with its actual present condition. In our first edition almost the only authority attainable was that of the patriarch of nautical description, William Dampier, who was on this coast on a buccaneering expedition in 1684-5.

ECUADOR, which is the southernmost republic of the present political division of Colombia, is divided from Peru by the Rio Tumbez; on the North

it is separated from that of the United States of Colombia or New Granada by the River Mora, in lat. 1° 30′ N. Its eastern limits are comparatively undefined and unimportant to our present subject. Prior to the present political state it formed a portion of the vice-royalty of New Granada; but upon the discontent and rebellion consequent upon the French invasion of Spain in 1808, it separated with that state from the Spanish rule in 1811. In 1819 these states coalesced, and were declared to found one republic of Colombia; but political feeling was very far from settled, and led to fresh warfare. In 1822 the royalists were defeated in Ecuador by General Sucre, while General Bolivar was victorious on the same side, in other parts. In 1823 Ecuador adopted the convention of Cucuta, and remained an integral portion of Colombia until November, 1831, when the territory separated into the present independent republics.

An interesting report upon the geography, commerce, &c., of Ecuador, was drawn up by Colonel G. E. Church, in 1881, and submitted to the United States Government, by whom it was ordered to be printed. He estimates the population to amount to about 1,000,000, only 100,000 of whom belong to the white race, nearly all of Spanish descent.

The UNITED STATES of COLOMBIA, or New Granada, which occupies the remainder of the Pacific littoral to the boundary with the States of Central America or Guatemala, is in many of its interior parts but very little known. Prior to the English Admiralty surveys, before alluded to, the charts of this coast were most deplorable.

The states are nine in number, containing a population of about 4,000,000 in 1881, the maritime states, on the Pacific coast, being those of Cauca and Panama. The capital of the whole is Bogota, elevated about 8,000 ft. above the sea, in the inland state of Cundinamarca, with about 100,000 inhabitants.*

These countries are rich in almost every tropical production, and stately timber is met with in perfection in almost all parts. The different features of the coast vary very much; the interior of the country exhibits some of the most magnificent natural features in the ridges of the Andes, which extend along the western part of the continent parallel to, and, in many parts, within sight of the coast.

The Andes of Ecuador increase in magnitude and elevation in advancing northward from the Peruvian boundary. The portion between 5¼° and 3¼° S. lat. forms the great mountain knot of Loxa, but which, however, does not rise into the limits of perpetual snow. Here, according to the maps, it separates

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* Further particulars, historical, geographical, and commercial, will be found in a valuable work published in Paris in 1883, by Senor Ricardo S. Pereira, entitled "Les Etats-Unis de Colombie." See also a Paper by Mr. R. W. Blake, "Notes on the Central Provinces of Colombia," in the "Proceedings of the Royal Geographical Society," May, 1883, pp. 249—265.

into two principal parallel ridges, which enclose the valley of Cuenca, which extends from 3° 15′ to 2° 30′ S., and is about 7,800 ft. above the sea. The mountains of Assuay, which form the North boundary of the Valley of Cuenca, and the western extreme of which approaches Guayaquil, rise to the elevation of 15,500 ft., and some of the peaks are above the line of perpetual snow. This transverse ridge is narrow, occupying only about 3 minutes of latitude (2° 30′ to 2° 27′). North of this are the valleys of Alausi and Ambato, extending to 40′ S., and are about 7,920 ft. above the sea. The summits of the ranges on the East and West, which enclose them similar to those to the southward, are of great elevation, and on the western range stands the famous *Chimborazo*, 21,420 ft. in height (according to Humboldt), and its peak covered with perpetual snow. It is a very conspicuous object from Guayaquil and the shores of the Pacific about Cape San Francisco. This majestic mountain, which has been so vividly described by Humboldt, was, from his measurements, considered as the highest summit of the Andes; it has every appearance of being an extinguished volcano. According to Mr Edward Whymper, who, in company with two Swiss guides, twice ascended this peak in the beginning of the year 1880, the height is 20,517 ft.; for an interesting account of his journey among the Great Andes of the Equator, see "The Proceedings of the Royal Geographical Society," August, 1881, pp. 449—469.

The most remarkable features of the coast of Ecuador are the sudden changes in the aspect, and climate of the country; places separated but a few miles differ widely from each other. At Guayaquil, there are mangrove swamps and impenetrable thickets; at Santa Elena, aridity and a scanty vegetation; at Salango, a moist atmosphere, and a soil densely covered with plants; at Manta, a desert; and in the bay of Atacames, again thick forests and plenty of rain.

Tumbez River, as previously stated, forms the boundary between the republics of Peru and Ecuador. Malpelo Point, at the mouth of this river, with Salinas Point, at the S.W. end of the Island of Puna, may be considered as the limits of the southern and principal branch of the entrance to Guayaquil River.

GUAYAQUIL.

Guayaquil is the most important port of this section of South America, being the entrepôt of the rich valleys of Ecuador, and the chief outlet of all the produce of the republic.

The extensive estuary, which is much embarrassed with shoals, has been buoyed, and means generally adopted, including dredging and the establishment of new lights, to avoid all inconveniences arising from the difficulties of navigation; so that a vessel may now proceed up the river to the city, a distance of 80 miles from the outer entrance, with tolerable facility; though

above Puna the depth at low water prevents any great draught being carried beyond, except at the top of spring tides. From a visit here in H.M.S. *Heroine*, in April, 1883, Capt. East reports that vessels drawing 19½ ft. can reach the city.

SANTA CLARA or AMORTAJADA ISLAND, with its lighthouse, is the best mark for making the river, and is excellently situated for this purpose, lying as it does quite outside of all the points of the river. The island itself is so remarkable, that it cannot well be mistaken; it is high, and on many bearings assumes the appearance of a gigantic shrouded corpse, which it exactly resembles when the centre bears W. ½ S. Thence comes the name of "Amortajada" or "Muerto," given to it by the Spaniards. It is about 1½ mile long, and is surrounded by shoal water.

The Lighthouse, an octagonal white building 32 ft. high, is erected on the breast of the island, about one-third from the head, and shows a *fixed bright* light, varied by a *flash* of four seconds every half minute; it is elevated about 256 ft. above the level of the sea, and the flash is visible 24 miles off, and the fixed light 18 miles, round the entire horizon. Sailing vessels pay 6¼ cents per register ton, and steamers half that sum, for the keeping of the light.*

Amortajada Shoals lie off the South end of Santa Clara, at a distance of 2 miles in a S.W., and 1 mile in a West direction. They consist of rocky patches, some awash, and others with 12 and 14 ft. water, with 4 to 6 fathoms among them, and 7 fathoms on their outer edge. Vessels approaching the island should keep the lead going, and come no nearer than 12 fathoms.

The South Coast of the river N.E. of Malpelo Point recedes so as to form a shallow bay, called Tumbez Bay, the points of which bear N.E. and S.W. from each other, 16 miles apart. The north-easternmost of these points is that of the *Tembleque Islands*, forming a portion of the low land at one of the mouths of the Tumbez. To the N.E. of this are some extensive shoals, called the *Payana Shoals*, dry at low water for 2½ miles from the shore, and extending 5½ miles to the N.E. of the point. *A black buoy with staff and ball* was laid on the *Payana Spit*, in 4½ fathoms. The water is deep, 12 to 15 fathoms immediately outside this buoy, and the whole space is clear between it and Amortajada Shoals.

At 13 miles N.E. by E. ½ E. from this buoy is the West point of the entrance to *Jambeli Creek*, or the mouth of *Santa Rosa River*, which runs to the South and has a good depth of water for its breadth, having 8 fathoms in its entrance. Above Machala Creek, 5 miles within it, the depth of the main river becomes irregular, and has much shoal water, though there is a deeper channel over on the West side.

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* Caution.—The light has, at times, not been shown for several nights together, from the keeper deserting it to procure provisions, and the *buoys here described are liable to be washed away.* Under these circumstances we cannot but caution all approaching and depending on their existence.

PUNA ISLAND, which forms the N.W. side of this part of the river, is about 28 miles long N.N.E. and S.S.W., and 12 miles broad. Its S.W. point, low and wooded, is called *Point Salinas*, and is in lat. 3° 3′ S. Shoals extend from it for 4 miles toward Amortajada Island, and northward along the western coast to the distance of 10 miles; but as they lie out of the general track of shipping, and have, moreover, not been amply examined, they will not be approached unnecessarily. They are reported to have extended considerably of late years, and it would be safer to pass South of Santa Clara.

Arena Point Light.—At 9 miles E.N.E. of Point Salinas is *Arena Point*, similar to Salinas Point, the shore between being fronted by shoals, which reach about 2 miles off the land in some parts. The lighthouse on Arena Point is a square building, 45 ft. high, close to the water's edge, and from it is shown a *red revolving* light, visible only for 16 seconds in each minute; it is elevated 65 ft., and visible 14 miles.

At Arena Point the coast assumes a N.N.E. direction, and extends 16 miles to the foot of *Mala Hill*, a direction mark, making like a moderately high island, and visible 16 miles off; at 3½ miles further E.N.E., is *Espanola Point*, from whence the coast trends to the N.E. and North, 4 miles to Mandinga Point and the town of Puna at the N.E. extremity of the island, and above which a vessel cannot proceed without the aid of a pilot.

The estuary here varies from about 14 miles to 6 miles in width. The space between the island and the main, though containing some good channels, is of irregular depth, and has much shoal water on its eastern side.

Espanola Point and Lighthouse.—Española Point is a remarkable cliffy point, amid the monotony of the mangroves which line the shores. It forms a useful mark to vessels from the southward to clear the Mala Bank. The lighthouse is erected on the summit of the point, and shows a *fixed bright* light, at an elevation of 131 ft. above the sea, visible 9 miles.

To the westward is the house and plantation of the English Consulate, and about three-quarters of a mile South of the point is a 10-ft. patch, with 6 and 4½ fathoms close-to. The shoals having lately extended from the point, it should be given a wide berth.

Mandinga Point and Light.—Mandinga Point, a bold bluff, forms the N.E. extreme of Puna Island, and on it is a square yellow tower, 32 ft. high, half a mile East of the town of Puna, and from it is shown a *fixed bright* light, at an elevation of 124 ft. above the sea, visible 10 miles.

Puna, a village just to the westward of Mandinga Point, is a place famous in the annals of the Buccaneers, by whom it was occasionally sacked, and the inhabitants at last retreated to Guayaquil. It is now frequently the resort of the principal persons of the latter city during the rainy season. It consists of about fifty houses and a church, the former, like most in this country, are raised on piles, about 10 ft. from the ground. This style of building has several advantages; the houses are in a great measure freed from the noxious

exhalation of the earth, better ventilated, and ants and other insects cannot make their inroads so easily. The Island of Puna appears to have been a place of some importance, and well inhabited under the Incas. Here Pizarro met his first check on his march along the coast, the islanders defending themselves with such valour that their reduction cost him six months. The coast from Mala Hill to this village is much higher than any other on the island, presenting a line of cliffs fronted with a beach, forming a pleasant contrast to the swampy mangrove shore to the southward. At Puna the River Guayaquil commences, and no ship should attempt the passage without a pilot, which is easily procured at that place.

Baja de Mala.—The principal shoal in the estuary is called the *Baja de Mala*, and consists of a chain of banks of different depths, 16 miles long and 1 mile in breadth, with from 2 ft. to 15 ft. water on them, extending from off Arena Point to Española Point. The channels through are only fit for small vessels. The channel West of the bank is that generally used, though the eastern one is broader and deeper.

Three bell buoys, painted *white*, have been moored on Mala Bank:—No. 1 near its South point; No. 2 on the centre of the bank, opposite the mouth of Rio Hondo; and No. 3 near the North point of the bank. They are liable to drift.

Puna Patch is a small bank 4 miles N. by E. ½ E. from the North end of Mala Bank, and 2 miles E. by N. from Mandinga Bluff, lying in the route of vessels using the eastern channel when bound to Puna for a pilot. It is about half a mile in circumference, with 1 foot on it at the shoalest part, and 4 to 5 fathoms close-to.

Tides.—It is high water, on full and change, at Santa Clara Island at 4^h; at Puna village at 6^h; and at Guayaquil at 7^h; the rise and fall at each place being 11 ft. In the gulf the tide stream appears to set in the same direction as the trend of the shores, from 3 knots at springs to 1 knot at neaps, the ebb stream being the strongest. Off Santa Clara the ebb sets to the South and the flood to the East. In all parts of the gulf, in a sailing vessel, it will be well to anchor with light winds and an ebb tide. Off Puna the flood sets to the N.W., and the ebb S.S.E. at about 2½ miles an hour at springs.

The CITY of GUAYAQUIL is the only port of the republic of Ecuador, and is therefore its chief point of interest to the mariner. It is the seaport of Quito,* Catacunga, Hambato, Riobamba, &c., &c., and indeed of all the rich

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* The city of Quito, the capital of Ecuador, is in a valley 9,543 ft. above the sea. Eleven snow-capped mountains are in view from it, the volcano of Pichincha being the nearest. It is in some parts regularly built, and has some handsome buildings; as the president's palace, formerly that of the Spanish viceroy, that of the archbishop, the cathedral, &c. Its inhabitants are variously estimated at from 40,000 to 70,000. Earthquakes are frequent, and the climate is a perpetual spring. Its exports are principally bark, hides, corn,

valleys between the Andes. In 1881, a new municipal law fixed the port dues at 3 cents per ton on vessels under 300 tons, and 1½ cent per ton on those above that tonnage.

"Guayaquil has no buildings of architectural importance—indeed, few cities in Spanish America possess much interest in this respect. The churches are constructed in a light fantastic style, not unimposing by moonlight, but looking too much like structures of card-paper to please in the day time; in the interior they are decorated in a tawdry manner, without taste or elegance. The streets, as usual in Spanish-built cities, are at right angles; but the plan, though regular, is not perfectly carried out, the area which the town occupies not being half built upon or inhabited. The chief object to admire is the fine Quay or Marina, extending for 1½ mile along the banks of the River Guayaquil. It is 60 ft. broad, coped with stone, and lined with a row of respectable houses, which make a fine display from the water, especially in the evening, when the rooms are lighted up. In the morning an immense number of canoes and boats, loaded with fruit, anchor off the quay, and one knows not which to admire most, the great variety of these productions, or the high state of perfection in which they are presented.

"There is some fine land near the town, which, from its flatness and the number of cattle grazing, looks much like the fen country in Cambridgeshire and Huntingdonshire. There are, however, some hills and some of the highest mountains in the world in the vicinity of this half-submerged district. To the North of Guayaquil stand three hills, known as the 'Cross Hills,' there being a cross on the brow of each; the eastern hill is 242 ft. above the sea, the middle 336 ft., and the western 284 ft.: tradition points them out as having been the site of a city in the time of the Incas. The population may be about 18,000 or 20,000."—*Dr. Seemann.*

The chief exports of Guayaquil are cocoa, Peruvian bark, ivory nuts, india-rubber, and coffee, the less important being cotton, hides, straw hats, &c. Their value is fluctuating: for the year 1881 it amounted to £769,400, but in 1880 to £1,159,501. The value of the cocoa exported in 1880 amounted to £833,745, and of india-rubber £59,972. The number of vessels arriving here in 1881 amounted to 210, with a total tonnage of 133,233, of which 115, tonnage 112,891, were British.

Within the last few years many improvements have been taking place at this port. The city, which had about 25,000 inhabitants in 1881, is now lighted

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and agricultural produce to Guayaquil, through which it receives European manufactures. There are roads which lead from most of the chief parts over the Andes to Quito, and the one to Guayaquil is extremely steep. The conveyance of merchandise to Quito, a distance of about 200 miles from Guayaquil, occupies about 14 days, and at a cost, in 1881, of 10 to 14 dollars for 250 lbs.

with gas, and supplied with good water; it has also lately been connected by *telegraph* with Europe, &c. In order to clear the channel of the rivers in the province, some steam dredges have been purchased from England. The new road from Quito to this port, which has been for some years under progress, is now finished from Quito to Sibambe, a distance of 165 miles. From Sibambe the government has commenced to construct a narrow guage railway to Pueblo Nuevo, a distance of 80 miles, the latter place being reached in 7 or 8 hours from Guayaquil by means of steamers. In 1881 only about 42 miles of the railway had been constructed, or as far as Puente de Chimbo, 1,111 ft. above the sea, at the base of the Andes, where the real difficulties commence, the line having to be carried over an elevation of about 11,000 ft.

The river is about 1½ mile in width, very rapid and muddy, the banks of slimy mud, dotted in every direction with alligators. The scenery is very like that of the rivers on the coast of Africa, and almost as productive of fever. About 10 miles below Guayaquil the river is not more than half a mile wide, and the banks dense mangrove swamps. All breezes are excluded, and the air is insufferably hot, even in the "cool season."

The water for the use of the town is brought from a considerable distance up the river, in earthen jars, from 100 to 150 of which are packed together in a *balsa*, formed of logs of a very light wood, lashed together with vine, and floated down. The water opposite to the town is fresh at the last of ebb, but is considered as unfit for drinking, passing, as it does, through a mass of poisonous mangroves. Plenty of large timber and firewood are also brought in the same way. Fresh beef and various kinds of fruit are likewise in abundance, and of course cocoa, which is the staple commodity of the place. The mosquitoes are so troublesome, that the ships lying opposite to the town are obliged to send their crews on shore at night.

On the opposite side of the river, on Santay Island, is, or was, a building slip, where several ships of a superior construction have been built,* and there is a gridiron to the northward of the city, on the eastern side of Cerros de la Cruz, or Cross Hills.

A patch, with only 13 ft. water on it, caused by the sinking of a ship, lies directly off the centre of the town, 1½ cable from the quay. The marks for it are the clock-tower on the quay, midway between the cathedral and church of San Augustin, bearing W. by S., and the western Cerro de la Cruz, open left of the church of San Merced, N.W. ½ W.

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* For a good account of Guayaquil, see Stevenson's Peru, vol. ii, chap. 7. Capt. Basil Hall also describes the state of the political relations, &c., at the time of his visit in 1821—Extracts, &c., vol. ii, chapters 35—37; and of the buccaneers' attempts, see Dampier, vol. i, p. 154, *et seq.* See, also, voyage of the *Herald*, before quoted, and the diary of Lieutenant Henry Trollope, R.N., 1847.

Directions for the Estuary.*—Vessels bound to Guayaquil from the southward should make the land about Picos Point, which is remarkable, having many small sandy peaks ; a few miles farther North is Malpelo Point, low, and covered with trees. Soundings of 41 fathoms, sand and oaze, will be obtained when 10 miles to the N.W. of this point. Coming from the northward, Santa Clara Island may be made, which is visible about 16 miles, and at first appears like three hummocks, and Zampo Palo, the high range on Puna Island, will generally be seen at the same time. Santa Clara should not be approached nearer than 2 miles, or within the depth of 12 fathoms, the best track being about 5 miles to the southward of it, in from 20 to 15 fathoms water, from whence a N.E. ½ E. course for 25 miles will lead abreast of Arena Point, between a and the South buoy† of Mala Bank. The channel West of Mala Bank is preferred, Mala Hill forming a good leading mark.

After passing Arena Point, continue on the same course N.E. ½ E., keeping a good look-out for the South buoy of Mala Bank, and when Mala Hill bears N. by E. steer for it. On this course you will have from 20 to 9 fathoms at low water, but northward of Puna Vieja it shoals to 4 fathoms, deepening again after passing Española Point. The water shoals gradually towards the island, so by keeping that on board as near as the vessel's draught will permit, and not going in more than 7 fathoms, which will keep you clear of Mala Bank, there is no danger, should the hill be hidden. When Centinela Point is shut in by Española Bluff, bearing N.E. ¼ N., haul out N.E., passing about 1 mile South of the bluff, in not less than 7 fathoms, and looking out for the North buoy. When Mandinga Bluff opens of Centinela Point, bearing N. ½ E., steer along the land until the village of Puna is seen, when you may stand towards it and come to about half a mile to the northward, with Mandinga Bluff bearing S. by W.

The eastern channel is wider and about the same depth, but has no good leading marks, and a ship must trust to her lead. After passing the South buoy of Mala Bank, steer N.E. by N. 10 miles, and then N. by E. 8 miles to the North buoy, taking care not to go into less than 4 fathoms ; and when the houses South of Española Point are shut in by the same bluff, bearing W. by S., you will be clear of Mala Bank, and may steer for Mandinga Bluff, which may be rounded at the distance of one-third of a mile. This channel may be used by sailing vessels working down the gulf, taking care not to go into less than 4 fathoms, and not to cross Mala Bank.

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* Pilots.—The only pilot station now in existence at the entrance of Guayaquil River is at the town of Puna, so that although the rate of pilotage from Arena Point has been fixed by the Ecuadorian Government, it is not possible to obtain a pilot there. Good pilots may be procured at Payta for the Guayaquil River, but H.M. ships usually proceed to Puna before taking a pilot.

† But see the note on page 270 *ante*.

The Bar of Guayaquil River lies 6½ miles to the northward of Puna, between the South end of Mondragon and Green Island; it is 2½ miles across, the least depth at low water springs being 12 ft. The channel to it leads between the mud-flats extending towards Puna from the bar and Green Island. Four *buoys* have been placed near the entrance, viz.:—one on the extreme and one near the middle of Mondragon Bank, one South of Green Isle, and one near Mongotis Bank.

Mondragon and Matorillos Islands are at the entrance to the river, and, although termed islands, are nothing but large banks covered with mangrove trees, actually growing in the water, forming a grove of innumerable pillars, at a distance quite ornamental, but from their monotony soon becoming to a stranger as wearisome as a barren desert, this being the general appearance of the banks of the river. Both to the northward and southward of Mondragon and Matorillos are extensive mud-flats, covered at half tide. There is a channel to the East of Mondragon, and also of Matorillos, but both are barred at their northern extremes, where they join the main river. The rivers *Naranjal* and *Taura* open into the Mondragon Channel, down which there is considerable trade to Puna.

The western or main bank of the river is of a similar nature to that of the islands, possessing occasionally small cleared spots. *Piedras Point*, 18 miles to the northward of Puna, is the most considerable of the cleared spots, and in the time of the Spaniards had a fort; there is a small hill over it, which is remarkable amid the low land. At 2½ miles to the southward of the point, at the entrance of the Mondragon Channel, is a small rock called the Baja, awash at low water. No vessel bound to Guayaquil should leave Puna without a pilot. With a sailing vessel the passage up the river is made easy by the prevailing fair wind; the return is generally accomplished by kedging. The stream runs from 3 to 4 knots, following the trend of the shores.

The *Morro Channel*, to the westward of Puna, is dangerous from the lowness of the lands, the absence of all good leading marks, and the numerous shoals. It leads to the *Estero Salado*, a singular creek, which runs parallel to the river, and nearly up to the city. For navigation it is valueless, but is interesting as being the route followed by General Florez when he took the city in one of the numerous revolutions.

The COAST to the N.W. of Puna has not been properly surveyed, but is represented to be fronted by extensive shoals, called the *Shoals of Chanduy*, for 48 miles as far as Carnero Point. Midway between the point and the Morro Channel are the *Heights of Chanduy*, which are conspicuous, but the coast, and the indraught into the Morro Channel, should be avoided. H.M.S. *Sappho*, 1883, sounded in 12 to 9 fathoms, about 7 miles off shore, with the Heights of Chanduy bearing N.E. by E. ½ E., and Santa Elena Point N.W. ¾ N.

POINT SANTA ELENA is 11 miles N.W. by N. from Carnero Point, and 69 miles N.W. ½ N. from Santa Clara Island. It is 424 ft. high, and forms the southern side of Santa Elena Bay, and is thus described by Dampier. (The allusion to the singular bituminous spring is still correct, and might be turned probably to some useful purpose).

" Point Santa Elena is pretty high, flat, and even at the top, overgrown with a great many thistles, but no sort of tree ; at a distance it appears like an island, because the land within it is very low. This point strikes out next into the sea, making a pretty large bay on the North side. A mile within the point, on a sandy bay close by the sea, there is a poor small Indian village, called Santa Hellena ; the land about it is low, sandy, and barren ; there are no trees nor grass growing near it. There is no fresh water at this place, nor near it. Not far from this town on the bay, close by the sea, about five paces from high-water mark, there is a sort of bituminous matter boils out of a little hole in the earth ; it is like thin tar. The Spaniards call it algatrane. By much boiling it becomes hard like pitch."

LIGHTHOUSE.—On Point Santa Elena stands a lighthouse, which shows a *fixed bright* light, with *flashes* at intervals of 2 minutes, elevated 470 ft. above the sea, and visible 25 or 30 miles.

The southern shore of the point for a distance of 8 miles is a line of beach and sand-hills, ending in a small creek, on the South shore of which is a rocky bluff ; at 1 mile to the eastward of this is a rock awash, the only danger on this side of the point.

SANTA ELENA BAY is to the northward of that point, and forms a good anchorage, but at 1 mile N. by W. from the hill is a 4½-fathoms spot, which should be avoided ; the little town of Santa Elena is 8 miles eastward of the point, and 1½ mile from the shore. Landing is easy at its custom-house. The chief trade is in salt made at some saltpans on the beach. There are no refreshments or water.

The P.S.N. Company's steamer *Colombia* struck, in 1878, on a shoal extending three-quarters of a mile N.W. of Ballenita Point, N.W. of the village. It consists of two shoals, about half a mile in extent N.E. and S.W., with 12 to 18 ft. water on them, and a *black buoy* was temporarily moored in 5½ fathoms, at 2 cables N.W. by N. from the western shoal.

Pelado Islet.—At 20 miles E. by N. ¼ N. from Santa Elena Point is the little Islet of Pelado, 72 ft. high, in lat. 1° 56′ S. It lies 3 miles N.W. of *Ayangui Point*, the channel between being clear, but a shoal extends nearly a mile off the point. At 3 miles S.E. of the point, on a small creek, the *Estero Balsa*, is a large village, well marked by a table hill, 258 ft. high, and Colonche Hill 6 miles inland. At 3 miles northward of the point is the village of *Valdivia*, where bullocks can be obtained, but the landing is bad.

From Ayangui the coast is clear, and trends in a general N.N.W. direction for 23½ miles to Salango Island ; but at 9½ miles N. ¾ W. of Ayangui Point is

Montanita Point, off which are some rocks; and 8 miles farther is *Jampa Point*, which also has rocks around it. At 2 miles N.W. of the latter, with a clear passage between, are the *Ahorcados* (hanging islets), a detached bank of rocks and islets.

Salango Island is 524 ft. high, covered with luxuriant vegetation, and about 3 miles in circumference. It forms an anchorage much resorted to by whalers who come here for food, water, and fresh provisions, all of which are to be obtained from an extensive plantation in the neighbourhood. The anchorage is to the northward of the island, in 15 to 20 fathoms, on a line N.N.E. and S.S.W. from the North point of the bay to the East point of Salango Island, and about half a mile from a rivulet on the main shore, which forms the watering place. There are a few rocks off the West point of the island, but they are steep-to; the passage between the island and the main should not be used. Large bamboos are found here, and fish are plentiful. The greatest surf prevails with a rising tide.

Callo Point is 14 miles N. by E. ¾ E. from Salango Island; at a mile southward of it is an islet named *Daphne Rock*, and a mile to the North of it is *Callo Island*, a small island only the resort of birds and seals, having no channel inside between it and the coast. Hence to Cape San Lorenzo the distance is 21 miles, N.W. by N., and off the coast, 14 miles distant, is Plata Island. The soundings between, as, indeed, they are all hereabout, are tolerably regular, increasing from 5 to 30 fathoms.

PLATA ISLE, W. by N. 18 miles from Callo Point, and S.W. by W. ½ W. 13 miles from Canoa Point, the nearest part of Cape San Lorenzo, was so named by the Spaniards, from Sir Francis Drake dividing his plunder on it in 1579.* It rises to 769 ft. in height, and is of a verdant shaggy appearance, from the large bushes or low trees that cover it. Its length is about 3 miles, and the western side is an entire cliff, of an inaccessible appearance; a few small islets appear off the South end of it. The watering and anchoring places are on the eastern side, in a small sandy bay, 2 cables from the shore, in 18 or 20 fathoms water. The bay of Salango is far preferable. The channel between Plata Island and the shore is clear, and used by steam vessels.

This island was a favourite place of resort with the buccaneers, it being most conveniently situated to watch the Plata fleets to and from Lima.

CAPE SAN LORENZO is the West extreme of a projection of the continent, the general line of which, in a N.N.E. direction, is indicated by some hills, of which *Monte Christo*, 14 miles inland of the cape, and 1,429 ft. high, is the principal. The cape itself is a small tongue, off which, for half a mile farther, three small islets and some rocks extend.

The bank of soundings off the coast, which preserves a generally uniform

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* This can scarcely be correct, as we are told Sir Francis Drake sailed for 24 hours off the land with his prize the *Cacafuego*, and then sailed westward.—See page 280 hereafter.

line from Plata Island, is much narrower off the cape, and does not reach farther off than about 3 miles, and the depth itself immediately off the cape is much greater than in other parts, irregular from 30 to 70 fathoms.

From Cape San Lorenzo the coast, which is of moderate height, trends to the N.E., and at 13 miles distant is the little Port of Manta. Off the intermediate points reefs and rocks extend a short distance, and the port in question lies to the S.E. of one of these projections.

Port Manta, a village 6 miles to the eastward of San Matéo Point, is the seaport of the town of Monte Christo, situated to the eastward of the hill of the same name; the principal exports are straw hats, ivory nuts, and caoutchouc. A *fixed bright lamp light* is shown at the North end of the village, elevated 82 ft., and visible 4 miles. The anchorage is to the northward of the houses, in 6 fathoms. Care must be taken of the shoal patches, which extend about three-quarters of a mile from the shore; there is no danger if attention is paid to the soundings, but a dangerous detached rock, with 7 or 8 ft. water over it, and which seldom breaks, is reported to lie 12 cables N. $\frac{3}{4}$ E. from the light. The landing is good, but no provisions or water can be obtained, the surrounding country being like Santa Elena, a mere desert; bullocks might be procured by communicating with Monte Christo.

If bound to Manta Harbour from the southward, it is advisable to make the coast at Sta. Elena Point, as a strong current generally sets along the coast to the northward, and the atmosphere is usually hazy. After passing San Mathéo Point, it is recommended to give the shore a berth of at least 2 miles until the bay opens, and wait for daylight before entering. The usual anchorage is in 5 fathoms, at about three-quarters of a mile from the shore, in good holding ground; but vessels anchor farther out during the rainy season (December to April), as there is usually at that time a heavy swell, the sea breaking in 16 ft. —*Capt. N. J. Hundewadt*, of the German barque *Berend*, 1880.

Caracas River, 27½ miles N.E. by N. ½ N. from Manta, is shoal, and difficult of access, but much used by the coasters, there being a considerable trade in cocoa. Santa Marta Bank, a small rocky ledge, lies about 1½ mile N.N.W. from Bellacas Point, the West point, with a depth of 5 fathoms in mid-channel between it and the main. The entrance to the river is to the eastward of this bank round Punta Playa, which is low and grassy, with a small rock off it; northward of this are two banks dry at low water. Between the small rock and the southern bank vessels drawing under 12 ft. may enter at high water, but the channel is narrow, about a cable broad, and should not be attempted by a stranger. The village is about half a mile to the southward of Punta Playa, from which the river runs in a S.E. direction for a distance of 6 miles. Fresh water may be procured by sending boats about 3 miles up the river. Bullocks can be obtained at the town, and fish is plentiful. It is high water, on full and change, at about $3^h\ 30^m$, the rise being 10 ft.

CAPE PASADO is 14 miles north-westward of Caracas Bay, and is in lat. 0° 21′ 30″ S. "*Cape Passao* (*Pasado*)," says Dampier, "runs out into the sea with a high round point, which seems to be divided in the midst. It is bold against the sea, but within land and on both sides it is full of short trees. The land in the country is very high and mountainous, and it appears to be very woody." A reef of rocks extends half a mile to the northward of the cape, and in the small bay formed by them there is fair anchorage in 6 fathoms, about a mile N.N.E. from the reef. Fresh water may be got here.

From hence to *Pedernales Point* (Shingle Point), in lat. 0° 4′ 10″ N., the distance is 35 miles, N.E. by N., and the same distance N. ¾ W. from the latter, is Cape San Francisco. Between these points there is no place of commercial importance. Before the whole of the coast a shoal extends, from 1 to 3 miles off, to the depth of 5 fathoms and under, so that it is advisable to keep 6 miles off the land, by which all danger will be avoided, and a depth of 10 to 30 fathoms found between Point Pedernales and Cape Pasado.

North of Pedernales Point the coast runs in nearly a *true* North direction, and is for the most part low and unhealthy. At 18 miles from it commence the *Cogomies Shoals*, which extend from thence to 4 or 5 miles from the land, and up to Mangles Point, in lat. 0° 27′ 28″ N. At 12 miles beyond the latter is Cape San Francisco, with which it forms an open bay. At 4 miles northward of Mangles Point is *Munpiche Point*, eastward of which is a village where water, cattle, and pigs are abundant.

CAPE SAN FRANCISCO is the South end of a high bluff, clothed with great tall trees. Passing by this point, coming from the North, you will see a small low point which you might suppose to be the cape, but you are then past it, and presently afterwards it appears with three points. The land in the country within this cape is very high, and the mountains commonly appear very black. The sea winds are here at South, and the land winds at S.S.E.—(*Dampier*). Dr. Seemann says that the cape is steep and well wooded, the cliffs in many parts white, and somewhat resembling those of Sussex and Kent.

It was off Cape San Francisco that Sir Francis Drake captured the Spanish ship *Cacafuego*, March 1st, 1759, and steering from the land all day and night, they lay by their prize, taking out her cargo, valued at 360,000 pesos, each nearly equal to 8s. English. The uncoined silver was worth upwards of £200,000.

The town of Cape San Francisco is in a small bay on the northern side of the four rocks, which lie off the River Bunche to the S.W. of Cape San Francisco. This bay having only 2½ and 3 fathoms in it will not permit a large vessel to go nearer than a mile, but by anchoring a quarter of a mile S.W. of the four rocks she would command both the River Bunche and the town of San Francisco.

Water and refreshments of all kinds may be obtained on this part of the coast; the River Bunche perhaps offers the most convenient place for procuring

bullocks, pigs, or vegetables. The small bay under the cape is advantageous for watering, the water being very good. Most of the cattle supplied to whalers at Atacames come from these places.

Galera Point.—At 12 miles around the coast to the northward of Cape San Francisco is Galera Point, low and shelving. The intervening coast is bold-to, and at the latter point it assumes an easterly direction. There is a small bay, with convenient landing just to the East of it.

From this point the coast trends to the N.E. by E., consisting, as far as Sua and Aguada Points, a distance of about 11 miles, of low white cliffs, crowned with trees and fronted by beaches studded occasionally with black rocks. *Sua* and *Aguada Points* are remarkable, being small cliffy peninsulas, each connected with the main by a sandy isthmus. Water may be procured from a small river eastward of the latter.

On the sandy peninsula at the mouth of the *Sua River*, which falls into the bay, is the grave of an accomplished young naturalist, Thomas Edmonston, who accompanied Capt. Kellett's surveying expedition. He was accidentally killed here by the discharge of a gun, in January, 1846. At the village, a mile inland, are large sugar-cane plantations. Tobacco, oranges, and pine-apples, are very abundant.

Atacames, a small town, is about 13 miles from Point Galera, on the East side of the mouth of a small river. It contains about 500 inhabitants, the construction of whose habitations is somewhat singular, but well adapted to the climate and other localities. They are built similar to those of New Guinea, being elevated on posts about 10 ft. from the ground, and consisting of only one storey.—(*Morrell*). Vegetables and fruit are abundant. Vessels should anchor in 5 fathoms about 1½ mile North of Aguada Point, with the town bearing S.E. ½ E. It is high water, on full and change, in Atacames Bay, at 3^h 37^m, the rise and fall being 13 ft.

Atacames Ledge.*—Off Atacames, a ledge, which commences at Punta Galera, juts out to the northward, ending in a dangerous ledge of coral, distant 7 miles from the land, lying N.W. by W. and S.E. by E., nearly 1½ mile long by half a mile broad, having an average depth of 12 ft., and only 6 feet water on its shoalest part. A *white bell buoy* is placed in 5½ fathoms at low water, on the N.W. point of the ledge, bearing W. by S. from Esmeralda Point, 12 miles. From the buoy, Galera Point bears S.W. ¼ S. 15¼ miles; Sua Point, S. by W.; and Isla Aguada Point, S. ¼ E. 7½ miles; at two-thirds of a

* This spit, and the irregularity in the depth off this part of the coast, compared with that to the southward, are remarkable. Perhaps they may be occasioned by the action of the *currents*, which, as we shall show hereafter, are very strong and peculiar in the vicinity.

cable from the buoy there is $1\frac{3}{4}$ fathom at low water. Vessels drawing more than 12 ft. must pass outside the ledge.

This ledge is dangerous to sailing vessels working to the southward out of Panama Bay, as both wind and current generally cause them to make the land about Atacames; care must be taken not to bring Galera Point to the westward of S.W. by S., nor to go into less than 10 fathoms.

At 14 miles N.E. of Atacames is the entrance of *Esmeralda River*. The coast is nearly straight, and off *Gorda Point*, 8 miles from Atacames, there are some rocks.

ESMERALDA RIVER takes its rise in the Andes, and, although of considerable size, is full of shoals, and unfit for sea-going vessels. On its left bank, about 2 miles from its mouth, is the village of Esmeralda, a place containing about 1,200 inhabitants in 1876, mostly negroes and zamboes; some mangrove islands lie off it. Mines of emeralds in the vicinity were formerly worked by the Jesuits. The principal trade at this port is cocoa and tobacco, the latter said to be the best on the coast; a considerable quantity of grain is grown, cotton is plentiful, and there is a small export of caoutchouc. In 1872 a road was in progress to Quito from Esmeralda. The P.S.N. Company's steamers call here once a month, each way.

A spit, about 6 ft. above high water, with some huts on its extremity, extends about three-quarters of a mile E.N.E. from *Coquito Point*, on the West side of the river entrance, and a reef is said to extend nearly a mile northward of the East point.

The bottom off the bar of this river is deep and singularly uneven, 84 fathoms being found alongside 7 fathoms, and the stream runs out with great velocity, the water being fresh 2 miles from the mouth. There is a safe anchorage for small vessels just inside the bar, which may be reached with common care. Lieut. Miller, H.M.S. *Amethyst*, 1876, says anchorage may be obtained off the entrance of the river in 8 to 10 fathoms, mud, with Gorda Point bearing S.W., and Coquito Point S.E.; thence the water shoals gradually to 3 fathoms, at one-third of a mile from the beach.

A *lighthouse*, in lat. 1° N., long. 79° 41′ W., painted *white* and *red*, stood on Coquito Point, West side of the entrance of Esmeralda River. The light was discontinued in 1875, pending its removal to Mount Coquito, and no notice has been issued of its being re-exhibited.

Verde Point, the next remarkable place on the coast, is a cliffy bluff, with a hill over it, 13 miles to the eastward of Esmeralda, the bight between forming the bay of San Matéo, the land reached by Pizarro on his first attempt on Peru, 1526, and where he again landed in 1531, and marched from thence to the famous conquest. There is a river 1 mile to the westward with a bar navigable at high water, and a small town on the eastern bank. From this point the shore is lower, with fewer cliffs, but having several huts and cultivated spots near them, giving the coast a more civilized appearance. The cliffs cease alto-

gether at the *River Majaqual*, 13 miles to the E. by N., at which point the low river land commences, continuing with only two breaks as far as Cape Corrientes, a distance of 300 miles.

The coast between the River Majaqual and Point Mangles is a shallow bight, in which are three large openings, apparently the mouths of rivers, forming the entrances to a considerable inland navigation, and leading to the *Pailon*, a deep basin of some extent. The land in this vicinity is owned by the Ecuador Land Company. *Santiago*, the first of these, 11 miles from Majaqual, is of considerable width, and in December, 1836, there were three passages through the breakers, the southern one being the best, but they probably alter with the freshes. There are several houses on the southern bank, and numerous cattle were seen. About 1 mile from the mouth is the village of *Tola*, from which there is an inland communication by a 3-fathoms channel for 30 miles.

Posa Harbour, 4 miles eastward of the Santiago, is the second of these openings, the coast between being fringed with shoals, extending 4 miles from the shore, on which the sea breaks continually. The passage into the harbour is through these, about 1 mile wide, with a depth of 12 ft. at low water; when inside the harbour is capacious and secure. The breakers extend in the same way to San Pedro, the best of the three esteros, into which the channel is broader, with about the same depth of water. No vessel bound to any of these ports should attempt to enter without a pilot, which can easily be obtained at Tola; the coast being so low and similar that no leading marks can be given distinguishable by a stranger. There are apparently two more openings on the northern shore of the bay, but they were not examined. No vessel should approach this coast within the depth of 10 fathoms, which is generally found at a distance of 4 miles from the land. It is high water, on full and change, in San Pedro, at $3^h\ 30^m$; the rise being 13 ft.

POINT MANGLES, the northern point of the bay of Panguapi, is low and sandy, forming the S.W. extreme of a low narrow island; the water is deep off it, there being 38 fathoms within half a mile of the point, and 100 fathoms at a distance of 3½ miles. Bullocks and fresh water can be obtained from a small village close to the point. From this the coast runs in a north-easterly direction for 19 miles, low and intersected with esteros or creeks, said to be the mouths of the *River Mira*, as far as *Boca Grande*, which is the largest, and rendered conspicuous by a considerable village surrounded with cocoa-nut trees.

PORT TUMACO, the boundary town of the United States of Colombia, lies 5 miles eastward of Boca Grande. The port is formed by the three islands of *Tumaco*, *Viciosa*, and *El Morro*, lying at the mouth of an estero, and may be recognized by the white cliff on the N.E. end of the latter island. There was but little commerce at this port in 1847, at the time of the survey, although the convenience for transporting merchandise to the interior of the country is well worthy of further attention. The town was a mere village of bamboo huts,

but of late years has increased in importance, its population in 1881 amounting to about 2,500. It is well supplied with fruit, and exports timber, chiefly mangrove and cedar.

La Viuda (the Widow) is a small rock, lying about 1½ mile to the N.E. of El Morro, useful as indicating the position of the entrance to Tumaco. *Farallon de Castillo* is a similar rock, off the North point of El Morro, to which it is connected at low water.

Vessels bound to Tumaco should make Point Mangles, and then run along the land on a N.E. by N. course for about 25 miles, until the cliff on El Morro is seen; and when it bears S.E. by E. ½ E., shape a course so as to pass midway between the Farallon de Castillo and La Viuda Rock, keeping, if anything, nearer the former, with not less than 12 ft. at low water; or pass eastward of La Viuda with the S.E. point of El Morro, open of the N.E. point, S.W. ½ S., until within 2 cables of the latter, when steer toward the S.E. point, and when the red-topped house near the *centre* of the town opens out, steer toward the town, keeping a little northward of mid-channel, and moor as convenient off the S.W. point of El Morro. The channel leading from the North to this anchorage is used by the P. S. N. Company's steamers, when the depth is not less than 19 ft. The officers of H.M.S. *Albatross*, in 1876, found the time of high water, in Port Tumaco, on full and change, to be $3^h\ 15^m$; springs range 12 ft. The current in the offing will generally be found setting to the northeastward.

Strangers, however, should not attempt to enter, but should anchor about 1 mile to the northward of the port, in 12 fathoms, with La Viuda bearing East. The chart will be the best guide.

CASCAJAL POINT, a bold red cliff with two hills over it, forming a remarkable feature in this singularly flat country, is nearly 9 miles to the northward of El Morro, the coast between them forming a deep but shoal bay. At the South part of this point lies the celebrated *Island of Gallo*, where Pizarro drew the line on the sand, over which thirteen only of his followers crossed, and with these he remained, while Almagro returned to Panama for reinforcements. From this to Guascama Point, a distance of 45 miles to N.N.E., the coast is a low and thickly wooded flat, forming the delta of the *River Patia*, which reaches the sea at this point, after a N.W. course of 200 miles through a rich and fertile valley. This river is said to be navigable for 90 miles to El Salto, and coal of excellent quality is abundant in the upper part of the valley. The whole coast between Points Mangles and Guascama should be approached with great caution, being low, and there being deep water near the banks.

Off GUASCAMA POINT, the bank which fronts the low land extends 4 miles from the shore, and so runs parallel to the coast of the Bay of Choco the whole way to the River Buenaventura, a distance of 110 miles. About 5 miles eastward of Guascama Point is the mouth of the *River Sanguianga*, into which

there is a passage through the breakers nearly a mile wide, with a depth of 5¼ fathoms in it. The coast from this to the River Buenaventura is flat and monotonous, with the single exception of *Tortuga Peak*, a small wooded hill 21 miles South of the river, and presents a most uninviting appearance, being low mangrove land converted into swamps by the overflowing of the numerous rivers; in clear weather a distant range of mountains may be seen, clothed to their summits with trees.

There are no less than 14 mouths of rivers on this length of the coast. These streams send a considerable volume of water into the sea. The inhabitants, although not numerous, are yet frequently met with, and during the survey, a house was generally in sight, especially at the entrance of the rivers. Inshore the flood sets N. by E. and the ebb S.S.W., about 1¼ mile an hour, but 40 miles from the coast there is generally a set to the N.E.

GORGONA ISLAND, a place famous in the annals of Pizarro, the Buccaneers, and earlier voyagers on this coast, is 24 miles to the N.N.E. of Guascama Point. It is about 5 miles long N.N.E. and S.S.W., by 1¼ mile broad, and is remarkable from its three peaks, the highest and centre one being 1,296 ft. above the sea. *Gorgonilla*, a rocky peninsula about 1 mile in length, lies off its S.W. end, and 1 mile to the westward of the southern point of the peninsula is La Roca, a singular sail rock, 60 ft. high. This part of the island should not be approached by a ship, as it is foul and rocky, and it is said that the ship *Bertha* struck on a reef 3 miles South of it, not on the chart, on December 28th, 1851. Gorgona is a beautiful island, and forms a pleasant contrast to the low dense wood of the mainland; it is well watered and productive where it has been cultivated. The anchorage is off the watering bay on the East side of the island, in 30 fathoms, about one-third of a mile from the shore. Water is good and easily obtained.

BUENAVENTURA RIVER, in the bight of the Bay of Choco, 77 miles to the N.E. of Gorgona Island, is a broad deep stream, navigable by vessels drawing 24 ft. as far as the town, a distance of 10 miles from the mouth. This is a port with great natural advantages, and promises to become a considerable emporium for the commerce of the state. The town is situated on the South bank, with a small barrack, battery, custom-house, and the residence of the governor, inhabited chiefly by negroes and mulattoes to the number of 5,000 in 1881. It has, however, a considerable and increasing trade, importing salt, garlic, straw hats, and hammocks, and exporting rum, sugar, and tobacco; steamers call here twice a month. It is not considered healthy, and provisions are scarce and dear. A railway is being constructed to connect this place with the town of Cali, about 45 miles inland, and 3,300 ft. above the sea; 12 miles of it were open to traffic in 1882.

Culo de Barca and *Vigia de San Pablo* are two off-lying islands on the North coast of the river entrance, which is composed of red sandstone cliffs, crowned with trees. The Vigia has the appearance of a gigantic wheatsheaf,

and is distant 4 miles from the entrance of the river, with Culo de Barca (boat's stern) 2 miles to the westward.—*Seemann.*

Basan Point, forming the North point of entrance to the River Buenaventura, is low and wooded, with a few houses on it, at which a pilot may be obtained. There is no regular establishment, but competent men are always to be had by sending a boat up to the town. *Soldado Point*, on the southern shore, a little more than a mile S. $\frac{3}{4}$ E. from Basan Point, is low and covered with mangroves. The river between these points is deep and clear, with the exception of a small shoal with 3 fathoms on it, lying 4 cables S.S.E from the houses on Basan Point.

Negrillas Rocks are a low and dangerous reef, about 2 miles in circumference, nearly covered at high water, lying 8 miles W. by N. $\frac{1}{2}$ N. from Culo de Barca, consisting of one large, and several detached rocks, with shoal patches; they are dangerous to vessels bound to Buenaventura in the thick weather so frequently met with on this coast, and no vessel should approach nearer to them than 10 fathoms. In clear weather the Vigia de San Pablo kept open of the land bearing E. $\frac{1}{2}$ S. will carry a vessel well to the southward of the reef.

It is high water, on full and change, off the entrance of Buenaventura River, at 4^h, but at the town it is said to be at 6^h, the rise and fall being 13 ft. The tides are regular, the ebb stream setting right out of the river, and running 2 knots; the first of the flood comes from the northward, and runs a little more than 1 knot.

Buenaventura River will easily be recognised by the red sandstone cliffs to the N.W. of the entrance, the more remarkable as they are the first met with northward of Point Cascajal. Large vessels, bound for Buenaventura, should make these cliffs, and thus avoid the shoal and dangerous bay South of Soldado Point, taking care at the same time of Negrillas Rocks. They should not, however, approach the cliffs within 3 miles, nor go into less than 5 fathoms, and anchor with Piedra Point, the western extreme of the cliffs, bearing North, and the entrance of the river E.N.E.

MAGDALENA BAY is a snug inlet, 3 miles wide and 20 miles deep, lying to the northward of Piedra Point, about 11 miles from the entrance of Buenaventura. Unlike the rest of this coast, its shores are cliffs of a moderate height, crowned with trees; it was not examined beyond the entrance in the survey of 1846. This bay may be entered to the eastward or northward of Palmas Island, but the passage to the westward between the island and the Negrillas Rocks is rather shoal. The northern is the best, between Palmas Island and Magdalena Point.

Magdalena Bay was recently visited by the Chilian barque *Mary*, for wood and water, which is to be obtained here, and also on Palmas Island. They found about 20 or 30 naked Indians on the shores of the bay, who collect caoncho and ivory nuts, which they sell at Buenaventura.

Palmas Island is a small bold island, 1 mile long by half a mile broad, 3½ miles from Point Piedra, with detached rocks off each extreme; the eastern and northern sides appear clear, but the soundings are shoal and irregular in the direction of Negrillas Reef.

About 2 miles to the northward of Magdalena Point, the cliffs cease and th low river mangrove coast recommences running in a N.N.W. direction to Chirambira Point, a distance of 25 miles, forming the delta of the river San Juan. The water shoals quickly on approaching the coast, 20 fathoms being found 3 miles from the shore.

POINT CHIRAMBIRA', the southern point of entrance to the Chirambira mouth of San Juan River, is remarkable as forming the only harbour and convenient landing place between Magdalena Bay and Cape Corrientes. The point has nothing to distinguish it, a rounding series of low spits running one into the other being all that can be seen. There is a considerable set from the river, and the bottom off the entrance, like that off Esmeralda River, is singularly uneven, 3 fathoms and no bottom at 33 fathoms, being within a cable of each other. Vessels drawing less than 15 ft. can anchor inside Chirambira Point, but a stranger should not attempt to enter. There are a few houses on the North bank, and a distillery rather on a large scale, although rough in material. Bullocks, pigs, and vegetables can be obtained here, but are dear, and two or three days' notice is required to send up the river for them.

SAN JUAN RIVER, whose delta opens at Chirambira Point, is a considerable river, flowing from the N.E., but its numerous mouths appear to be blocked by rocks and shoals. One spot discussed for the inter-oceanic communication between the Atlantic and Pacific was by a canal between the head waters of the San Juan and the Atrato falling into the Gulf of Darien.*

THE COAST, northward of Chirambira Point, trends in nearly a direct line North (true) to Cape Corrientes, a distance of 73 miles; it is somewhat similar to that of the Bay of Choco, being low land, intersected by numerous rivers. The water shoals gradually, 2 fathoms being generally found within 1 mile of the beach, and occasionally much nearer. There is a low table-land to the northward of the River Usaraga, about midway between Chirambira Point and Cape Corrientes: two low peaks are also seen to the northward of the *Usaraga*, abreast of the rivers *Baudo* and *Catripe*, about halfway to the cape. These are

* Captain C. S. Cochrane thus speaks of it:—"After an hour's travelling I came to the rising ground that divides this stream from the one on the Citera side. I particularly inspected it, and found the distance from one stream to the other to be about 400 yards, and the height of the ground necessary to be cut through about 70 ft.; but after digging a very few feet you come to the solid rock, which would make the undertaking expensive; besides which, it would be necessary to deepen each stream for about a league, so that I think the least cost would be 500,000 dollars to make a good communication from the Atrato to the San Juan."—*Cochrane*, vol ii, p. 431; but it never can become serviceable from its distance.

the only elevations, as the mountain range visible in the Bay of Choco was not seen on this part of the coast. Houses are frequently met with, especially at the mouths of the rivers; the inhabitants, however, generally avoid communication.

CAPE CORRIENTES, easily known by the dome-like *Peaks of Anana*, about 1,500 ft. high, which rise directly over it, is the first high land North of Monte Christo, and generally makes like an island from the southward. It is densely wooded from the summit of the peaks to the high-water mark, the almost constant rains giving a bright green colour to the peaks. *Alusea Point*, 8 miles North of the cape, forms the northern extreme of this remarkable promontory; the cape is well named, as there appears to be a constant northerly set in the vicinity.

Cabita Bay, on the South side of Cape Corrientes, lying to the eastward of a high rocky point, about 3 miles from the cape, although open to the southward, forms a good anchorage and capital watering place. Vessels may lie in 18 fathoms about 7 cables from the stream in the bight of the bay, with the western horn bearing S.W. by W. About 5 miles to the S.E. of the watering place is the mouth of the *River Jeya*, to the southward of which is a remarkable perforated rock named *Iglesia* (or Church) *de Sevira*. There are a few houses in the bay, but the inhabitants are timid.

The coast from Alusea Point trends to the eastward for 14 miles to the *River Nuki*, a mountain stream, the shore between them being alternate bluffs and sandy beaches, with a few small streams. At this river there were also houses occupied in 1847 by an Englishman and some Indians. About 8 miles N.N.W. from Nuki is a cluster of high rocks, 2 miles off the little *River Chiru*, and 3 miles to the northward of this group is *Morro Chico*, a pinnacle of a similar nature.

PORT UTRIA, 8 miles further, was unknown before the survey of the *Herald*, and is a snug creek-like harbour, about 3 miles long by half a mile broad, with an average depth of 12 fathoms. It is formed by a lofty but narrow peninsula, with two islets and some detached rocks off its South extreme. The entrance to the port is to the south-eastward of these, with no hidden dangers, the shores being steep-to. The eastern side is a sandy beach, running out to a spit 2½ miles from the entrance. At this point the harbour is only 2½ cables across, but opens out after passing it, forming a commodious basin, in which a vessel may refit or heave down. This port will be easily known by Playa Baia, a beach about 4 miles long, fringed with cocoa-nut trees, situated to the northward of the peninsula, the land behind it being low. At its North extreme is the mouth of the little River Baia, with a rocky islet lying off it.

POINT FRANCISCO SOLANO, 12 miles northward of the River Baia, is a long, rocky, tongue-like point, forming the western side of the deep bay of Solano. The coast southward is high and rocky, with occasional small beaches.

There is a patch of rocks 3 cables from the shore, about 6 miles to the southward, and the water is deep, 40 fathoms being found within a mile of the coast. A reef, consisting of rocky patches, with deep water between, extends 1¼ mile to the N.N.W. from the point, and should be carefully avoided.

SOLANO BAY, a spacious but deep anchorage formed by Francisco Solano Point on the S.W., and a lofty promontory, which juts out some 3 miles, on the North, abounds in fish, wood, water, and a great quantity of wild cocoa-nut palms. There are also considerable groves of vegetable ivory (*Phytelephas sp.*), a beautiful palm-like plant, found in low damp localities, seldom intermixed with other trees or bushes, the ground beneath them appearing as if it had been swept. In 1847 a cargo of these nuts could have been collected with ease, the groves being close to the shore, in the vicinity of the sandy beaches.—*Seemann.*

About 2 miles S.W. of the northern point of the bay is a small chain of rocky islets, nearly 1 mile long, the centre benig a remarkable sugar-loaf. They are barren and frequented by large numbers of gannets.

CUPICA BAY (or Tupica), to the eastward of Point Cruces, nearly 22 miles northward of Francisco Solano Point, is one of the best anchorages on the coast. It has a village on the river at the head of the bay, with some plantations, from which vegetables can be obtained. The houses, like those to the southward, are built on piles; in fact, this style of building extends from the River Tumbez to Garachiné Point at the entrance of the Bay of Panama. *Point Cruces* is a lofty, straggling point, forming the West side of the bay, with outlying rocky islets extending 2 miles to the southward. It is high water, on full and change, in Cupica Bay, at $3^h\ 30^m$; the rise being about 13 ft. The current in the offing sets to the northward.

This bay has been of some celebrity, in consequence of its being one of the points proposed for the junction of the Atlantic and Pacific Oceans. Two expeditions in the year 1873 were sent to examine and report on the practicability of a canal. Both expeditions made their starting place Cupica Bay. The first, under Captain Selfridge, started from Chiri Chiri in 6° 30′ N., and examined the route by the Bojeya tributary of the Atrato, and found the highest land 700 ft. above the sea, rendering a tunnel 3 miles long necessary. The total length of *canal* by this route would be 28 miles. The other expedition, fitted out by the Peruvian Government, anchored off the village of Pajas, in Cupica Bay, and made the starting point in the small Bay of Limon, lat. 6° 40′ N., long. 77° 23′ W., where the Cordillera rises abruptly from the sea to a height of 600 ft., down which a torrent rushes. By the route examined by them the *canal* would be 30 miles long, by way of the Napipi and Limon torrent, and a tunnel 5 miles long required. The Napipi River joins the Atrato 150 miles above its mouth, and at its junction is 1,500 ft. wide and

30 ft. deep. The descent of the Limon torrent would require thirteen locks. Further examinations were to be carried out of other routes.

It must be inferred, that the Baron Humboldt (who did not visit this spot himself) was misinformed on the subject.

"A monk of great activity, padre of a village near Novita, employed his parishioners to dig a small canal on the Quebrada de la Raspadura, which is a branch of the San Juan; by means of which, when the rains are abundant, canoes laden with cacao *pass from sea to sea.* This interior communication has existed since 1788, unknown in Europe. The small Canal of Raspadura unites, on the coasts of the two oceans, two points 75 leagues distant from one another."—*Humboldt.*

M. Gogueneche, a very intelligent Biscayan pilot, is said to have been the first who turned the attention of the Spanish government to this part for communicating between the oceans.

CAPE MARZO.—From Point Cruces the coast trends to the north-westward as far as this cape, which is of a similar nature, having detached islets extending 1½ mile southward, and also a bay to the eastward named *Octavia Bay*, which, although smaller than Cupica, yet, like it, possesses convenient depth for anchoring. In addition to the detached islets already mentioned, there is another patch of high barren rocks of fantastic shapes, lying about 1½ mile to the southward of the last, the passage between being deep and clear. The coast on the western side of the cape is bold and rugged, but thickly wooded, running in a North direction for nearly 8 miles, to some more detached islets lying 1 mile from the coast, with 16 fathoms in-shore of them.

The coast from the islets trends sharply to the eastward for 2 miles; the cliffs ceasing at the mouth of the *Corredo*, a small stream, from which a continuous line of beach, with low land behind it, extends to the N.W. for 14 miles, as far as *Ardita Bay*, which may be known by a small islet lying off it; several canoes were seen, and some little distance inland is a village called *Jorado.* From this bay to Point Piñas, a distance of 32 miles, the coast is high, rugged, and thickly wooded, having deep water close to the shore, with the exception of two small bays about 21 miles northward of Ardita, the northern of which, named *Gusgava*, has convenient anchorage.

PINAS BAY, about 3 miles to the northward of the point of the same name, is the best anchorage between Octavia Bay and Garachiné Point, being about 2 miles long by 1½ mile wide, with an average depth of 10 fathoms, but open to the S.W., from which quarter there are occasional squalls in the wet season, throwing a considerable swell into the bay. Good water is found in a stream running into the sea at the West extreme of the beach at the head of the bay, protected from the swell by a small natural mole on its western side. Off the western point of the harbour are the *Centinelas*, two high barren rocks.

GARACHINE POINT, the southern point of the bay of the same name, is 33 miles to the northward of Piñas Bay, the coast between being high, bold

and wooded. About 3 miles S.W. of the point is Cape Escarpado, off which lies the islet of Cajualo. The land over Garachiné is very lofty, *Mount Zapo*, a sharp conical peak, rising to an elevation of about 3,000 ft. above the sea.

Garachine' Bay, lying to the N.E. of the point, between it and Patino Point, 12 miles distant, is shoal, the shore being low mangrove land, forming the mouths of the River Sambo, with mud banks extending 3 miles from the coast. There is a bank 5½ miles long lying directly between Garachiné and Patino Points, with patches of 15 ft. water on it, having 4 and 5 fathoms inside; and 4 miles N.W. by W. from the former point is a small patch of 4½ fathoms, with 6 and 8 fathoms close-to. Vessels may anchor close off either of these points, the water being deep in their vicinity.

GULF AND BAY OF PANAMA.

Garachiné Point on the East, and Cape Mala on the West, may be taken as the limits of what is called in the late surveys the Gulf of Panama. These points lie E. by N. ½ N. and W. by S. ½ S., 103 miles apart. The depth of the gulf within this line is about 80 miles, the City of Panama being at its head. Panama Bay is the space between the main and the Pearl Archipelago.

Until the survey of 1849, by Captains Kellett and Wood, R.N., we were dependent for our knowledge on the excellent Spanish charts, and on the still singularly correct description given by Dampier, about two centuries ago. But as these surveys, and the accompanying directions, have supplanted them, we give the following from the Admiralty Directions, with additions from other sources.

SAN MIGUEL BAY, to the North of Garachiné Point, on the eastern side of Panama Gulf, was well known to the Buccaneers, who used it as the entrance to the Pacific in their overland journeys from the Gulf of Darien, which they generally accomplished under ten days. After Dampier's time (1685) it was almost forgotten until 1851, when the idea of a ship canal was suggested to connect it with Caledonia Bay, in the Gulf of Darien.

The entrance is 6½ miles wide, between *Lorenzo Point* on the North, and *Patino Point* on the South. Off the former, is *Iguana Island*, and 3 miles to the northward the month of the River Congo, which Dampier wished to use in his journey. From Iguana Island the bay opens, being nearly 11 miles across as far as Pierce Point, a projecting rocky point on the North shore.

Buey Bank, an extensive shoal, drying in patches at low water, on which a heavy sea breaks, is 6 miles in circumference, its inner edge lying nearly 1½ mile S.W. from Lorenzo Point, but the passage between should not be used, as there is only 10 ft. water in it, and generally a heavy swell. A spit with 12 ft. extends off its S.W. end for 1½ mile, and only 4½ fathoms is found nearly 5 miles from it; vessels should not stand within that depth. Colorado Point, kept open of Patino Point bearing N.E., is a good mark to clear this

bank, and also for running into the bay. The western side of the bay is little known, but is reported to be shoal; the eastern side has plenty of water along it.

Off Patino Point, which is just separated from the main, there is no known danger; at 2½ miles inside this in a N.N.E. direction, is Colorado, a bold rocky point, with a conspicuous patch of reddish clay on its face, the coast between forming a bay; for 1½ mile further up the bay the land gradually gets lower, and forms *Point Hamilton*, it then falls back to the eastward, forming another bay. *Washington Island*, nearly 3½ miles N.N.E. from Point Hamilton, is densely covered with wood, and lies rather more than a mile from the inner point of the bay last spoken of. The channel up the bay is to the northward of Washington Island, between it and *Jones Island*, a conspicuous little rock about 20 ft. high, and covered with grass, lying 1½ mile to the N.W. by W.

The coast from abreast of Washington Island takes a northerly direction for about 6 miles to Stanley Island, the channel lying between the coast and a group of islands on the West as far as Strain Island, the eastern of the group. At this point *Barry Rock*, 20 ft. high, lying about 3 cables from the eastern shore, contracts the channel to 1 mile in width, the passage on its West side being by far the best. The channel continues of about the same breadth to Virago Point, a distance of 2½ miles.

Stanley Island, a low wooded island 1½ mile long by 1 mile broad, divides the channel into two passages, both leading into Darien Harbour; the principal one, or Boca Grande, being a continuation of the bay in a northerly direction past the West and North sides of Stanley Island, and the other, or *Boca Chica*, between its southern end and Virago Point, on the South shore. The latter channel, although much shorter, is too narrow for a sailing vessel to use with safety, on account of the rapid tide in it.

Boca Grande, between the rocks outside the Boca Chica and Milne Island on the western shore, is 1 mile broad, and continues nearly the same width for 1½ mile between Stanley Island and the shore. After passing the Boca Chica steer to the N.W., and do not approach Stanley Island within 3 cables, as a dangerous rock lies off its N.W. point. The navigable channel at this point is three-quarters of a mile wide, and begins to turn to the eastward round the North end of Stanley Island. The channel then bends back to the S.E. into Darien Harbour.

DARIEN HARBOUR, a magnificent sheet of water extending for 11 or 12 miles in a S.E. direction as far as the village of Chupigana, is formed by the junction of the Tuyra and Savannah Rivers. The depth of water from Paley Island as far as the mouth of the Savannah, a distance of 2 miles, is from 10 to 4½ fathoms, beyond which there is not more than 12 to 18 ft. at low water springs. The best place for anchoring is off the village of Palma, 1 mile to the southward of Price Point, on the South side of the Boca Chica, in from 7 to 10 fathoms, at about 3 cables from the shore.

The River Tuyra, the *Santa Maria* of the Spaniards and Buccaneers, rises in lat. 7° 40′ N., and enters Darien Harbour near the village of *Chupigana.* Twenty miles from this point, near the junction of the River Chucunaque, are the ruins of the old Spanish fort of Santa Maria, near which were the gold mines worked by the Spaniards in the 17th century. The *River Chucunaque* rises in lat. 8° 50′ N., westward of Caledonia Bay on the Atlantic; its course appears to have been the favourite track of the Buccaneers from the Atlantic to the Pacific.

Savannah River, which was the one generally preferred for the proposed junction of the oceans, rises in lat. 8° 44′ N., and a few miles from its source meets the *River Lara*, where the bottom is level with the half-tide.

It is high water, on full and change, in Darien Harbour, at 4^{h}, and the spring rise is said to be 24 ft. The tides in the narrows run proportionally strong, and great care should therefore be taken.

SAN JOSE′ BANK, a dangerous shoal, 1 mile long by three-quarters of a mile broad, in the centre of which is *Trollope Rock*, with only 2 ft. water, lies in the fairway of ships bound to Panama from the southward, being 15 miles W. ¼ S. from Garachiné Point and 9 miles E.S.E. from Galera Island, the south-eastern of the Pearl Islands. It is easily avoided either by keeping on the main shore until Garachiné Point bears to the southward of East, or by passing about 2 miles from Galera Island, taking care of the shoal patch and rocks off its southern side.

PERLAS, or PEARL ISLANDS, also known by the names of *Islas del Rey, Islas del Istmo,* and *Islas de Colombia,* form an archipelago on the eastern side of the Bay of Panama, consisting of sixteen islands and several rocks. Isla del Rey is the largest, San José, Gonzales, Casaya, Saboga, and Pacheca are of secondary, and the rest of minor importance. There are from 30 to 40 fishing villages scattered about these islands, containing about 2,000 inhabitants, chiefly engaged in the pearl fishery, which is said to produce about two gallons of pearls a year; the shells also form a lucrative article of commerce much inquired after by French vessels. In 1874 the government prohibited any oysters being dredged for the space of seven years, on account of a disease having appeared among them, probably owing to over-fishing. These islands are low and wooded, the soil fertile, but not much cultivated; most of them belong to merchants at Panama, who employ negroes to plant and cultivate them. The numerous cocoa-nut groves, and bright sandy beaches, intersected by small rocky bluffs crowned with trees, give these islands a pleasant appearance.

Pacheca, Saboga, and Contadora, with the islets of Bartholomew and Chipre, are a group in the northern part of the archipelago, forming between them a good and capacious harbour, well suited as a depôt for steamers. Pacheca and Contadora are covered solely by palm trees, unmixed with any others, which is singular. Saboga, the largest island, on the East side of

which is a considerable village, has a reef extending 1½ mile to the northward, which, with Chipre to the southward, forms the western side of this harbour, Pacheca and Bartholomew being on the northern, and Contadora on the south-eastern side; the latter island has 5 fathoms close to its N.W. shore, which is low and well adapted for wharves.

This harbour is about 2 miles long by nearly 1 mile broad, with an average depth of 9 fathoms; it has three entrances, each possessing a 5-fathoms channel, which may be used as best suited to wind and tide. It is high water, on full and change, at Saboga Island, at 4^{h}; springs rise 14 ft,

Vessels using the *Pacheca Channel* should pass within half a mile of the small island West of Pacheca, and stand to the southward until the centre of Bartholomew Island bears E. by S. ½ S. Steer for it on this bearing until the northern islets off Saboga open westward of Saboga, bearing S. by W. ½ W., when the vessel may haul to the southward for Contadora. Lieut. Fleet, H.M.S. *Gannet*, 1880, remarks that when entering by this channel upon the ebb tide, the East extreme of Saboga Island must not be brought to bear eastward of S. ½ E. to avoid being set upon the N.E. rocks of the ledge extending North from Saboga, several of which cover at from one-third to two-thirds flood.

If entering by the *Contadora Channel*, a ship should pass half a mile to the eastward of Bartholomew Island, and not stand to the westward before the nearest islets North of Saboga open northward of Saboga, bearing W. by S. ¼ S., which leads through. Care must be taken not to open them too much, as there is a 2-fathoms patch off the N.E. end of Contadora to be avoided.

Vessels from the eastward using the *Saboga Channel*, which is reported to have several shoal spots in it and should be used with caution, should pass half a mile eastward of Contadora, and continue standing to the southward until the outer islet on the reef off the South end of Saboga opens southward of the same island, bearing W. ½ S. Steering on this course will clear the vessel of the sunken rock in this channel, which lies nearly 1 mile off the South side of Contadora; and when Pacheca is shut in by Saboga, bearing N. ¼ W., you may stand to the northward, and run through the channel, which is steep-to on both sides. If this harbour were used, a few buoys would greatly assist the navigation.

Chapera and Pajaros lie next to the southward, with a 4-fathoms channel between them, but the ground is foul, and it should not be used. No vessel should attempt the passages South of Chapera Island, between it and Isla del Rey.

Casaya, Bayoneta, and Viveros, with several islets and rocks, are the largest islands on what may be termed an extensive reef stretching off from the N.W. point of Isla del Rey, about 8 miles long by 5 miles broad, the passages between them being foul with occasional strong tides. A shoal, 1½ mile long by three-quarters of a mile wide, having only 9 ft. water on its shoalest part, lies nearly

4 miles to the eastward of the North point of Casaya. The whole of these islands should be avoided by vessels bound up the bay.

ISLA DEL REY, the main island of the group, is about 15 miles long by 7 miles broad, with several peaks on it, the highest being about 600 ft. above the sea. Numerous islets, having deep water between them, lie off its western shore, extending 3 miles from the coast, but they should not be approached by strangers within the depth of 10 fathoms. *Cocos Point*, its southern extreme, is a remarkable promontory jutting into the sea, 4 miles long by about 1 mile wide, its extreme cliff being crowned (in 1859) by an umbrella-like tree, which makes it conspicuous. East of this point is the fine *Bay of St. Elmo*, with convenient anchorage in all parts, and a good stream of water at Lemon Point, in the bight of the bay.

The eastern shore has also islands off it, but they are steep-to, and may be approached to half a mile, with the exception of Canas Island at the eastern point, where there is a 3-fathoms patch lying outside a sunken rock, nearly $1\frac{1}{2}$ mile from the shore.

San Miguel, the principal town of these islands, on the North side of Isla del Rey, is of some size, possessing a conspicuous church; it is, however, badly situated, landing being difficult at low water. Two hills (the Cerro Congo and Cerro Vali) lie to the southward of it, the former being 481 ft. high. Supplies are uncertain and dear, being generally all sent to Panama. Care must be taken in approaching it, as the bottom is irregular, and rocks abundant.

GALERA, a small island, generally the first land made by vessels bound to Panama, is $7\frac{1}{2}$ miles E. $\frac{3}{4}$ S. of Cocos Point, like which it is remarkable for its umbrella tree. A cliff forms its southern side, sloping down to a beach on the North, and to the southward a reef runs off for nearly 1 mile. This island should not be approached within the depth of 10 fathoms, but there is a good passage between it and Cocos Point, by using which the vessel will be clear of San José Bank.

GONZALES, or *Pedro Gonzales*, lies on the West side of Isla del Rey, with a broad, deep channel between it and the islets before mentioned. It is about 12 miles in circumference, and has on its northern side two bays, protected from the North by the Islands of Señora and Señorita. These bays, called *Perry* and *Magicienne*, were re-examined in 1858 as to their capabilities for a depôt for steamers, and although not so good or so near to Panama as the harbour South of Pacheca, yet still have some advantages. They are divided by the little peninsula of *Trapiche*, off the East point of which is a rocky ledge, terminating in a shoal with 14 ft. water, 3 cables from the point.

A large stream of water runs into the sea on the western side of Magicienne Bay. This bay, however, is small and shoal, without the advantages of Perry Bay, which is 1 mile wide, and runs back for the same distance. *Senora* and *Senorita*, including the shoal off their eastern side, are about 1 mile long, and

lie nearly the same distance northward of Trapiche, with a 7-fathoms channel between, steep-to on both sides.

Gonzales was purchased in December, 1857, by the British Government, of an American citizen for £1,000, the New Granada Government consenting and retaining the sovereignty. No building was to be erected on it, but a vessel was to be moored. It was intended as a watering station for H.M. fleet.

It is high water, on full and change, in Perry Bay, at 3^h 50^m, the rise being 16 ft. The tide stream is not felt in the anchorage, but there is a considerable set off the island, the flood setting to the northward, and the ebb to the southward, the latter being generally the stronger.

San Jose' Island, about 6½ miles long by 3 miles broad, lies 4 miles directly South of Gonzales, the summit forming a table land. Nearly 2 miles S.E. from Iguana Point, the northern extreme, is a large waterfall, running into the sea, and forming an excellent watering place.

Passage Rock is a dangerous sunken rock, with 12 and 9 fathoms alongside of it, lying near the centre of the channel between San José and Gonzales, which otherwise is deep and clear. It is 1½ mile from Gonzales, and 2½ miles from San José. Vessels should keep between the San José shore and this rock.

The COAST.—*Brava Point* forms, with Lorenzo Point, from which it is distant 2 miles, the northern point of entrance to San Miguel Bay. Both these points are edged with reefs and outlying rocks.

Farallon Ingles is a small but high island, lying at the edge of the shoal off the River Buenaventura, about 5 miles to the northward of Brava Point ; 12 and 15 ft. water is found on its western side. *Gorda Point*, bold and woody, with 4 fathoms close-to, lies 4 miles northward of the Farallon ; there is less swell after passing this point. The *Pajaros* are two small rocky islets, 4 miles northward of Gorda Point, with 4 and 5 fathoms to the westward, but only 12 ft. between them and the shore. At these islets the 5-fathoms shoal commences, which continues in front of the coast round the Bay of Panama as far as Point Chamé, on its western shore.

The River Trinidad, 2½ miles northward of the northern islet, has a low rocky point, forming the S.W. point of the entrance. A 3-fathoms channel was found into this river, extending 1½ mile from the point. *Shag Rock*, a barren islet, frequented by birds, with shoal water round it, lies 2½ miles from this entrance. *Mangue* and *Majaguay*, 7 miles from the River Trinidad, are high, wooded islets at high tide, lying on a mud flat. There is a depth of from 10 to 12 ft. water to the westward of them. *Chiman River*, to the northward of these islets, is wide at the mouth, but shoal, being nearly dry at low water. On the eastern side, under a hill, is the small town of *Chiman*. This was the spot to which Pizarro retired in 1525, after beating about for 70 days with much danger and incessant fatigue, without being able to make any advance to the southward. He was here joined by Almagro, and the following year they sailed again for Peru.

Pelado Islet, W. by S. 4 miles from Mangue Islet, directly off the mouth of the River Chiman, is a flat level islet of small extent, and about 60 ft. high; it has no trees, but is covered with a coarse prickly shrub. It is steep-to on all sides, and forms a useful mark to vessels bound up the bay for Panama, who need not go in-shore of it.

Chepillo Island, 31 miles N.W. by W. ¼ W. from Pelado, is described by Dampier as the most pleasant island in the Bay of Panama; it lies off the mouth of the *River Chepo*, about 2 miles from the coast, and is 1 mile long by half a mile broad, very fertile, being low on the North side, and rising by a gentle ascent towards the South, over which is a remarkable tree, forming an excellent mark to vessels bound up the bay; the southern point may be approached within a mile, but the other sides are shoal, a reef running off its northern point in the direction of the river. The coast between this island and Pelado is low river land with mangrove bushes, and mud flats dry from 2 to 4 miles off, with shoal water beyond.

The land North of these rivers is of some elevation. *Column Peak* and *Asses Ears*, about 12 miles North of Chiman River, and *Thumb Peak*, at the West extreme of the range, are conspicuous.

Chepo River extends some distance into the interior of the isthmus, having its source near the head of the Savannah River. The entrance is to the westward of Chepillo Island, through a 10-ft. channel, about 3 cables broad. Vessels should stand no nearer than 6 fathoms between Chepillo and Panama, on account of the shoal water.

PANAMA.

PANAMA is one of the "Gates of the Pacific," and from the very earliest times has held an important position in the connection between the Old World and the Pacific. For within a year of the discovery of the great ocean a town was established in its vicinity.* During the Spanish occupation of these regions, it was periodically the scene of much activity, as the plate-fleet from Lima, with numerous merchant vessels with goods and treasure, came every three years for their transport across the isthmus to Porto-Bello. This continued, more or less, to the downfall of the Spanish power in America, but was also seriously affected by the establishment of a regular commerce round Cape Horn. With the growth of trans-oceanic steam navigation it began again to revive, but the gold diggings in California suddenly brought it into prosperity, which was wonderfully enhanced by the completion of the railroad in 1855.

* "Nata, on the West side of the Bay of Panama, was the first town built by the Spaniards on the coast of the South Sea. It was founded in 1517. The following year they established themselves at Panama."—*Herrera, Historia de las Indias Occidentales*, dec. 2, lib. iv, chap. i.

The site of Panama has been once changed. Where the old city stood, which is about 4 miles N.E. of the present situation, was already, when the Spaniards first reached it in 1515, occupied by an Indian population, attracted to it by the abundance of fish on the coast, and who are said to have named it "Panama" from this circumstance, the word signifying much fish. They were, however, speedily dispossessed, and even so early as in 1521, the title and privileges of a city were conferred on the Spanish town by the Emperor Charles the Fifth. In the year 1670 it was sacked and reduced to ashes by the buccaneer Morgan; and it was only after this built where it now stands. Its present position is on a tongue of land, shaped nearly like a spear head, extending a considerable distance out to sea, and gradually swelling towards the middle. The old site is now quite deserted, but is well marked by a tower.

Immediately about Panama, East along the coast, and N.W. from it, the land is low and flat, but West and N.E. the mountains approach it closely; and from a hill called *Cerro Ancon*, about a mile West from the city, and 540 ft. high, an excellent bird's-eye view is obtained of the whole adjoining country, including the city, the islands in the bay, the neighbouring plantations, the mountains of Veragua, the Pearl Islands, the flat country towards Chagres, the elevated chain between Porto-Bello and Panama, the Rio Grande, the low land along the coast towards the Pacora and Chepo, Panama Vieja, &c., all which come successively under review, and together constitute a landscape beyond measure beautiful.

The city consists of two parts, the city proper of San Felipe, occupying the peninsula, and the suburb of Santa Ana on the isthmus. It contained a population of 25,000 in 1881, 5,000 being foreigners, who form the business portion. It has an imposing appearance from the sea, and is lighted with gas. There is a fine cathedral, built about two centuries ago, and lately repaired and restored.

Panama affords the usual supplies which are to be obtained in tropical regions, but are generally dear; provisions of excellent quality may, however, be obtained from the United States by ships requiring them; and, when time will admit of it, getting such from the States is far preferable to purchasing in the markets of Colon or Panama.

Water can be obtained at Panama from the tank of the United States' mail steamers; but it is cheaper at Taboga, where it may be purchased at 2 dollars a ton. Coal* may be bought here at times from the mail companies, but it is generally dear. The cost of coal imported into Panama by way of Cape Horn being 16 dollars per ton, and by the railroad 15 dollars. Consuls of all nations reside at Panama.

In 1881, 178 vessels, with a total tonnage of 213,845, entered this port, of which 68, tonnage 96,407, were British; this is exclusive of the regular British

* Some coal beds are reported to exist on the banks of the River Indio, lying between Aspinwall and Panama, which may become of importance.

and American steamers, which amounted to 124 in number, and 203,986 tonnage. The cargoes were principally for transit across the isthmus to Colon, the prosperity of Panama being dependent on the traffic.

On board ship Panama is by far the most healthy place on the coast of Central America. Vessels of war have remained here many months at a time, their crews continuing in a healthy state, excepting those men who had the will and opportunity to indulge in the vile spirit (*aguardiente*) of the country, which is cheap and easily procured. The yellow fever that existed at the Morro of Taboga in the early part of 1859 was confined to that spot, and, with few exceptions, the victims to it were men of drunken habits, and for this reason commanders should avoid giving liberty to their crews at Panama.

The Railway was commenced in January, 1850, and finished on January 28, 1855, under the able superintendence of Colonel G. M. Totten. Its total length is 45 miles, 3,020 ft.; it runs on the right or easterly bank of the Chagres from the Atlantic terminus, as far as Barbacoas, whence it crosses the river by a wrought-iron bridge, 625 feet long, in six spans. This is exactly midway between the two ends. The highest point is 37¾ miles from the Atlantic, and 263 ft. above the mean sea level. The total expenditure on the railway was 7,407,553 dollars—about £1,500,000 sterling. The fare across the isthmus is (or was) £5 4s. 2d. sterling, or 2s. 2¼d. a mile; only one class, one of the dearest travelling roads in the world. The time occupied is 4½ hours. The northern terminus, Aspinwall, or Colon, as it is termed in England, is a busy, thriving New England town, in great contrast to the Spanish Pacific terminus. The Panama Station is to the eastward of the city, and is connected with an iron pier, 450 ft. long, up to which the smaller steamers come for the transport of passengers and merchandise between the shore and the ocean steamers at Perico and Flamenco. About 20,000 passengers a year pass across by the railway, the number in 1879 being 23,729. A longer pier and docks are very much wanted at Panama.

A fixed red light is shown from the railway wharf a quarter of a mile northward of the city.

The Panama Canal.—On May 29th, 1879, the Inter-oceanic Canal Congress, assembled at Paris, decided that the most feasible of the seven proposed routes for a ship canal to connect the Atlantic and Pacific Oceans was that across the Isthmus of Panama, between Limon Bay and Panama, as surveyed by MM. Wyse and Reclus. Under the auspices of M. de Lesseps, the projector of the Suez Canal, a public company was formed to carry this design into effect at an estimated cost of *about* £24,000,000, including the purchase of the railway, and it was expected that it would be open for the passage of vessels in 1886; but from the progress already made it seems impossible that this can be realised.

The canal leaves Limon Bay a little North of Manzanillo, and here some large harbour works are to be constructed at the mouth of the River Chagres,

the course of which the canal will follow for about 4 miles. Thence it follows nearly the line of the railway, debouching into the Pacific at Perico, close to Panama, where it is to be widened to form a harbour. The total length will be about 45½ miles, with a depth of 27 ft. 10 ins., and a width varying from 73 ft. in hard rock, to 188 ft. in soft earth, with sidings at intervals for the passage of vessels. About 100,000,000 cubic yards of earth and rock will have to be removed; the summit ridge is 287 ft. above the mean sea-level.

Among the many great difficulties the engineers will have to contend with, besides the climate, are the great bodies of water brought down in the rainy season by the Chagres River and the Rio Grande, and other streams, the route of the canal crossing and re-crossing these rivers. To obviate these floods it is proposed to construct canals to carry the water off, and also to form a large reservoir in the upper valley of the Chagres. The range of tide is also about 20 ft. higher at Panama than at Colon, which will much interfere with the project of a canal free from locks, a difficulty it is proposed to overcome by establishing large lock chambers at the Panama end.

Petillo Point, 1¼ mile to the N.E. of Panama, is a black rocky promontory with two small hills over it; rocky ledges extend from this point for 1½ cable, and off their extreme a depth of 10 ft. may be found. A great portion of the bay, between this point and Panama, is dry at low water springs, yet at its entrance there is a depth of 8 ft. It is termed *El puerto*, or port of Panama, and it is here that most of the minor trade of the gulf is carried on by means of bongos, large canoes made from trees of such dimensions that some of them formed from a single trunk have measured 12 tons. *Buey Point*, only seen after half-ebb, forms the southern horn of this bay; the long rocky ledges extend 3½ cables from the N.E. bastion, 5 cables from the S.E. bastion in an easterly and 2½ cables in a southerly direction, forming a bay southward of Buey Point, in which is easy landing after half-flood, on a sandy beach in front of the Monk's gate. The general landing, however, is round Buey Point, at the market place on the northern side of the town. These ledges around the city, composed of rock with sand patches between, although now irksome and often dangerous to boats, afford every facility for erecting substantial piers and improving the port.

The S.W. part of Panama Road is embarrassed by rocks and shoals. Although these dangers are mostly above water, yet this part of the Bay of Panama should be avoided.

Perico and Flamenco, with the outlying rock of *San José*, are a group of islands forming the South side of Panama Road. Ileñao and Culebra, the western and southern parts of Perico, are connected with it by an isthmus of beach and rocks; but at high water these present the appearance of three islands. Perico is the head-quarters of the United States mail steamers, the bay on its northern side forming a convenient anchorage, while on the isthmus, which is sandy on that side, steamers of 2,500 tons have been easily beached. Vessels using this anchorage after passing the island of Flamenco should

keep close round the North end of Perico, and anchor when the isthmus opens. Large vessels drawing over 20 ft. may coal at Perico by passing West of the group at half-tide, with Ancon Hill (which on that bearing makes like a cone), just open of Ileñao, N.N.W.; pass about a cable's length from Ileñao, and anchor off its N.W. end in 24 ft., when Perico opens. In both cases attention must be paid to the time of tide.

Danaide Rocks, a patch of conical rocks on the eastern ridge of the road, with only 15 to 18 ft. on them, surrounded by 3½ and 4 fathoms, lie E. by S. 2¼ miles from the S.E. bastion. These rocks are awkwardly placed, lying in the track of vessels standing for the anchorage, keeping their luff with the land breeze. It is a favourite fishing place, and vessels should avoid canoes seen in that vicinity, as they are probably fishing on the rocks. *Sulphur Rocks*, a dangerous reef, one mile to the N.W. of the Danaïde, have a rock awash in their centre. *Knocker* and *Taboga Rocks* are two sunken rocks, with only 6 ft. water on them; the former has a *red* buoy, with *staff and flag* on it, and lies nearly one mile E. ½ N. from the S.E. bastion; the latter lies a little more than 2 cables to the S.W. of the buoy, with 16 ft. water between and 12 ft. in-shore of them, but no stranger should attempt to pass West of the Knocker Buoy.

Tides.—It is high water, on full and change, in Panama, at 3^{h} 23^{m}; springs rise from 15 to 22 ft., and neaps from 10 to 16 ft. The ebb sets South from 1 to 1½ mile an hour, and is stronger than the flood which runs to the N.W.

Directions.—Sailing vessels bound to Panama should endeavour to get within 3 or 4 miles of Chepillo Island, especially between December and June, and so have all the advantages of the prevailing northerly wind. From this point Ancon Hill will be seen, and should be kept a little on the port bow, as the wind hauls to the westward on approaching Panama. Vessels drawing over 18 ft. should pass South of Danaïde Rocks, by not bringing San José Rock on with the West point of Taboga S.W. by S. ½ S. until the cathedral towers are open to the eastward of Ancon. Having passed the Danaïde the ship is fairly in the road and may anchor according to her draft; if not more than 18 ft. she may have Tortola just shut in by Ileñao, bearing S.W. by S. ¾ S., and San José open East of Taboguilla, the eastern of the Taboga group. Larger vessels, drawing 24 ft., may come to the North of Perico, with the peak of Urava, the centre of the Taboga group, on with the East point of Flamenco, bearing South, taking care not to open Changarmi northward of Perico. If it is necessary to work up the road to an in-shore berth, tack on the western side just before Perico and Flamenco touch, and in standing to the eastward do not open San José of Taboga Island.

Vessels drawing 14 ft. may pass North of the Danaïde and South of the Sulphur Rocks, with the Hermanos Rocks on with the right side of the peak between the Rivers Grande and Falfan, then San José on with the peak of Taboguilla bearing S. ½ E., leads between Sulphur and Knocker Rocks, and they may anchor North of the buoy in 16 ft., keeping it between Perico and Flamenco, with Gabilan, a rocky peninsula West of the town, just shut in

by the S.E. bastion. During neap tides they may anchor more to the N.W.

Panama Road, although shoal, may be considered secure; the ground being muddy holds well. A sailor, resident in Panama for five years, remarks, that during that time there was no known case of a vessel being driven from her anchor; and with good ground tackle and proper precaution a vessel might lie there all the year round with one anchor down. Attention to the tides and soundings of the roadstead will enable a vessel to lie close in at times for the discharge of cargo.

TABOGA ISLAND, with those of *Urava* and *Taboguilla*, form a pleasant group of islands, about 4 miles long by 2 miles broad, lying 9 miles to the southward of Panama. Taboga, the highest and largest, 935 ft. above the sea, is well cultivated, with a considerable village on its N.E. side. To the northward of the village is the Morro of Taboga, a small hill, connected with the main island by a low, sandy isthmus, covered at high water. This place is the head-quarters of the Pacific Mail Company, who have here a steam factory and coal stores, also a gridiron, 300 ft. long (reported to be destroyed in 1877), on which H.M.S. *Magicienne*, a vessel of 1,255 tons, was repaired in 1858.

Vessels visit Taboga from Panama to procure water and supplies, both of which are more readily obtained than at the city. Water can be procured from the company's tank at 2 dollars per ton. The anchorage formed by the Morro is convenient, being about 3 cables from the shore in 10 fathoms, with the peak of Urava on with the high cliff at Taboga, and the church from S.W. ½ S. to West. Vessels coaling at this island should avoid giving liberty to their crews on account of the fever.

Urava is a small, lofty island, separated from the S.E. point of Taboga by a narrow and shoal channel; off its southern extreme is the small islet of *Terapa*. *Taboguilla*, 710 ft. high, also well cultivated, with some islets off its S.W. extreme, forms the N.E. island of the group, with a wide and deep channel between it and Urava, in the centre of which is a rock, said to dry 4 ft. at low water springs, with 8 and 14 fathoms close to.

The Coast from Bruja Point to Chamé Point, a distance of 16 miles, forms a shoal bay, with several outlying banks and rocky islets, and vessels bound to Panama should keep near the islands of Taboga, and not approach this shore within the depth of 5 fathoms. About one mile to the N.E. of Vique Cove, which is 5 miles westward of Bruja Point, is a lofty treble-peaked hill, called *Cerro de Cabra*, forming a conspicuous object to vessels bound to Panama, and frequently mistaken for Taboga by those coming from the eastward.

Melones Island is a small rocky islet 2½ miles to the N.W. of Taboga, with a rock above water, lying about half a mile to the northward of it. *Chamé Island*, with *Perique Rock*, are of a similar nature, situated about the same distance southward of Taboga. *Valladolid* is a large rock, nearly 2 miles to the S.W. of Chamé Island, with 9 and 10 fathoms close to it.

Chame´ Bay, at the head of which is a small river of the same name, is nearly

filled up by large banks, of which the largest is the Cabra Bank, lying in the middle, with Tabor Isle on it. On the southern side is Chamé Point, a singular, low, woody promontory jutting into the sea, 5½ miles long by half a mile broad. Between this and Cabra Bank is a convenient harbour, 2 miles in length by about three-quarters of a mile in breadth, with from 3 to 8 fathoms water in it, and from 16 to 18 ft. close to the beach of Chamé Point. To the N.W. of the river is a high range called Sierro Capéro, and to the southward are the Cerro Chamé, a group of wooded hills.

Otoque and Bona, high and peaked, with *Estiva Island* and *Redondo Rock*, lying 6 miles to the S.E. of Chamé Point, form a group similar but somewhat smaller than Taboga and Taboguilla, being cultivated, and having a considerable village, called *La Goleta*, in the bay on the western side of Otoque. Anchorage, in from 10 to 14 fathoms, may be found in any part of this group, and all dangers are above water.

PARITA BAY, large and open to the eastward, is nearly 20 miles across, lying 45 miles to the S.W. of Chamé Point. The coast between is a continuous beach, called Playa Grande, in front of a low wooded bank. There is a depth of 4 to 5 fathoms at 2 miles off this beach, except S.E. by S. ½ S. of Cerro Chamé, where there is only 4 fathoms nearly 7 miles from the land, and thence extending to Chamé Point. To avoid this, vessels from Parita Bay should steer so as to pass about 2 miles southward of Bona, when they may steer up the bay, inside but nearer the islands than the shore.

The mud flats are found again on the western side of Parita Bay; but at *Liso Point*, on the South side of the bay, the beach again commences, and extends as far as Cape Mala, 38 miles to the S.E.

Iguana Island, a little higher than the adjacent coast, and thus forming a conspicuous object, lies about 9 miles to the northward of Cape Mala, and 2 miles off shore. The island is steep-to, except at its South and East points, with 15 fathoms in the channel between it and the main. A reef is said to stretch to the N.E. of it.

CAPE MALA, which forms the western point of entrance to the Gulf of Panama, is a low but cliffy point with outlying rocky ledges having deep water close to them. The land from the N.W. slopes gradually down to the sea at this point from a considerable distance, making the exact cape difficult to distinguish, unless the breakers are seen. On opening the gulf round this a strong southerly set is generally experienced, especially in the dry season.

SECTION III.

THE ISLANDS OF THE SOUTH PACIFIC OCEAN.

Having in the previous pages described the coast line which bounds the Great Ocean on the East, we come to a far different order of features in the "cloud of islands" which are distributed over the wide expanse of water separating the eastern and western worlds.

Before commencing this task, it will be better for the casual reader of these pages to dismiss from his mind any notions of the magnitude and extent of the land which thus dots the surface of the Pacific that may be gathered from the representations of them. Any ordinary chart or map, particularly on a small scale, gives a very imperfect idea of the actual relative sizes of the greater part of these singular natural features. The necessary exaggeration of the scale of the minute but important specks in such a representation would greatly mislead. Another point, too, is that the names attached to these islands add to their apparent magnitude; and thus, what is in reality but a mere point on the ocean—scarcely discernible at a few miles distance—becomes, in appearance, on the chart of as much importance as a spot very many times greater in magnitude. As an example, the Caroline Archipelago, which makes such a formidable array of land and names, extending over 27° of longitude, would not, with all the land composing its various groups, with the exception of the two islands which are volcanic, cover a greater surface than is occupied by St. Petersburg and its suburbs. This remark will equally apply to the whole of the coral groups, which are the distinguishing features of the great world of waters.

The islands of the Pacific Ocean are to be separated, generally, into two classes, those of coral structure, and those of volcanic formation. This subject has received a great deal of attention from the naturalists of the present day, and in the foremost rank of this honourable array stands the name of the late Charles Darwin, Esq., who accompanied Capt. FitzRoy in the *Adventure* and *Beagle* during their arduous services. Some outline of this gentleman's views on the volcanic and coral formations are given in the North Pacific and Japan Directory. Another prominent name is that of James D. Dana, Esq., who accompanied the United States Exploring Expedition. It is needless here to dilate on these points.

The order that has been chosen for the accompanying description differs in some points from that followed by Admiral Krusenstern in his invaluable work, and to which, it cannot be too often repeated here, we owe so much in our pages. In the Memoirs Hydrographiques the islands and shoals are described in the order of their longitudes in the South and in the North portions of the Pacific. In this work, on the other hand, the islands and shoals have been arranged in zones of latitude, which arrangement is presumed to be simple and easy of reference, and more readily understood.

To these prefatory remarks may be added, that they commence with the southern land and proceed westward, and thus extend to the northward in the same order.

The separate islands of a group will all be given under the head of the group to which they belong; but detached islands, or those not depending upon any other, will be given in separate sentences.

One important point in these regions of shoals and detached specks of land is the amount of accuracy with which their position has been ascertained and transferred to our charts. This is very various: in some cases whole degrees remain in doubt; in others we may suppose that much less than a mile is the utmost amount of variation from the truth. It would be impossible to give a synopsis of this: attached to the notice of each island is generally some remark as to the accuracy of the position given; but, in general, all the older observers have been found to err greatly from the truth. Many ships, furnished with instruments and chronometers of the first order, have traversed the Pacific Ocean of late years, and have furnished a series of stations, so to speak, which the seaman with inferior equipments may do great service to navigation by measuring from. In too many instances it is owing to the use of separate and independent observations, which are necessarily made at considerable intervals, thus opening a chance for the multiplicity of error, that so much confusion has arisen in the geography of the Pacific.

With all our knowledge of its different regions, there is still a rich harvest to be gathered, and in one important particular, that of verifying or ascertaining the exact character of older discoveries.

Vigias.—Capt. Maclear, H.M.S. *Alert*, 1880, on the subject of the numerous *vigias*, reported in the South Pacific, says, "that whenever the surface of the sea becomes smooth '*confervoid algæ*' appear on the surface, and form masses of discolouration very like the colour of a coral reef some 3 fathoms below water. The officers of the *Alert* were occasionally deceived by these; also, when there is any meeting of currents of different temperatures shoals of fish often appear, and large fish splash and spout water so as to resemble breakers." Sometimes the peculiar glint of the sun, between the strata of low clouds, shining upon the water, gives it a perfect imitation of breakers.

CHAPTER VIII.

SOUTH SHETLAND.

This inclement and volcanic archipelago, forming a part of the eastern portal of the Pacific, extends in a N.E. and S.W. direction for about 260 miles, being separated by deep channels and surrounded by islets and rocks. Its discovery has been of great service to the mercantile world, from the vast amount of sealing and other marine produce that was subsequently drawn from it. This pursuit, so eagerly followed, was succeeded by the natural consequence—the diminution of the animals that rendered this knowledge valuable.

For the first notices of the discovery of this archipelago the world is indebted to Mr. William Smith, commander of the brig *Williams*, of Blyth, by whom the land was first seen in the month of February, 1819. On a subsequent voyage from Monte Video to Valparaiso, in October of the same year, the *Williams* again made the land, coasting westward along the North side of the range from what was afterward named Livingston Island to Smith Island.

"The weather becoming thick and squally, we made sail to the westward, having sailed 150 miles to the W.S.W. The weather moderating, saw another headland, bearing by observation E.N.E., distant 10 leagues; very high. Observed in lat. 62° 53′ S., and long., by chronometer, 63° 40′ W. of Greenwich; called this Smith's Cape. Then found the land to extend from the latter cape in a southerly direction. Then shaped the course for Valparaiso."

Capt. Cook's description of the Isle Georgia well applies to South Shetland. The country consists of numerous islands, without a vestige of vegetation. A species of moss only is found upon the rocks near the shore; eternal snows covering the more remote parts, which are mountainous. Nature in these regions assumes the most sterile and forbidding features: the thermometer was at no time below the freezing-point; but the melting snows near the shore so completely saturate the soil as to check all vegetation. A species of *coal* was found in abundance, which burnt very well, thus affording the means, if wanted, of replenishing the fuel. The rise and fall of the tide is about 12 ft. Shrimps and penguins beyond all conception numerous. The islands, headlands, &c., have been named, and observations ascertaining the latitude and

longitude repeatedly made. Part of an anchor-stock, evidently Spanish, being bolted with copper, and bearing certain marks, was found on shore, and is presumed to be the only vestige now remaining of a 74-gun ship of that nation which sailed from Spain, bound to Lima, in 1819, and has not since been heard of.

Several United States' vessels have visited South Shetland; and an American states that some of the harbours are very good, vessels in them being land-locked. Of the first three months of the year 1821, the mildest experienced there was March; but the seals had mostly retired to the water. A solitary spot or two of something like grass were the only marks of vegetation. No field-ice was seen, but innumerable islands were floating about. The flesh of the young seals was often eaten, and was not disagreeable.

An early account of South Shetland stated that sperm-whales were seen about the coasts; and it cannot be questioned that such whales may be occasionally here; but we have the authority of Capt. Laurence Frazier for stating that the whales hereabout are mostly fin-backs.

About twelve months after the first discovery of South Shetland, the British naval commander-in-chief on the South American station directed a further exploration; and for this purpose a hired brig, the *Slaney*, was sent, under the command of Mr. Edward Bransfield:—"We sailed," says the reporter, "from Valparaiso on the 20th of December, 1819, but did not arrive on cruising ground till the 16th of January, 1820, having been almost constantly harrassed with baffling winds and calms till we arrived in a high southern latitude. On that day, however, we had the good fortune to discover the land to the south-eastward, extending on both bows as far as the eye could reach. At a distance its limits could scarcely be distinguished from the light white clouds which floated on the tops of the mountains. Upon a nearer approach however, every object became distinct. The whole line of coast appeared high, bold, and rugged; rising abruptly from the sea in perpendicular snowy cliffs, except here and there where the naked face of a barren black rock showed itself amongst them. In the interior the land, or rather the snow, sloped gradually and gently upward into high hills, which appeared to be situated some miles from the sea. No attempt was made to land here, as the weather became rather threatening, and a dense fog came on, which soon shut everything from our view at more than 100 yards distance. A boat had been sent away, in the meantime, to try for anchorage; but they found the coast completely surrounded by dangerous sunken rocks, and the bottom so foul and the water so deep, that it was not thought prudent to go nearer the shore in the brig, especially as it was exposed to almost every wind. The boat brought off some seals and penguins, which had been shot among the rocks; but they reported them to be the only animated objects they had discovered. The latitude of this part of the range was found to be 62° 26′ S., and its longitude 60° 54′ W.

"Subsequently we traced the land 9° or 10° East and West, and about 3° North and South, and found its general appearance always the same; high, mountainous, barren, and universally covered with snow, except where the rugged summits of a black rock appeared through it, resembling a small island in the midst of the ocean; but from the lateness of the season and the almost constant fogs in which we were enveloped, we could not ascertain whether it formed part of a continent, or was only a group of islands."

A full description of the sea-elephants and seals of these regions, with their peculiar habits, is given by Capt. Weddell in the relation of his voyage, pp. 134—142; in conclusion, he observes:—"The quantity of seals taken off these islands by vessels from different parts, during the years 1821 and 1822, may be computed at 320,000, and the quantity of sea-elephant oil at 940 tons. This valuable animal, the fur-seal, might, by a law similar to that which restrains fishermen in the size of the mesh of their net, have been spared to render 100,000 furs for many years to come."

SOUTH-WESTERN LANDS.—On the 12th of February, 1832, Captain Biscoe, in the *Tula*, was advancing from the westward, and in lat. 66° 27′, long. 81° 50′, many birds were seen—albatrosses, penguins, cape pigeons, &c., with several hump and finned-back whales; and no fewer than 250 ice-islands were counted from the deck. On the 15th, land was seen, bearing E.S.E., but at a great distance. Latitude of the ship, 67° 1′, long. 71° 48′. On the following morning the land was ascertained to be an island, and called *Adelaide Island*, in honour of her Majesty; and, in the course of the ensuing fortnight, it was further made out to be the westernmost of a chain of islands, extending E.N.E. and W.S.W., and fronting a high continuous land, which Capt. Biscoe believes to be of great extent. The range of isles has since been called *Biscoe's Range*.

The main land was named by Capt. Biscoe *Graham's Land;* but it is unquestionably the same which was marked in the old charts by the name of *Gherritz Land*, it having been discovered in 1599 by Dirk Gherritz, of the *Good News* yacht, one of the five Rotterdam ships which doubled Cape Horn, and which he reported to lie in 64° S.*

Adelaide Island is described as having a most beautiful appearance, with one high peak shooting up into the clouds, and occasionally appearing both above and below them, and a lower range of mountains extending about 4 miles from North to South, having only a thin covering of snow on their summits, but toward their base buried in a field of ice and snow of the most dazzling brightness, which slopes down to the water, and terminates in a cliff of 10 or 12 ft. high, riven and splintered in every direction to an extent of 200 or 300 yards from its edge. At a distance of 3 miles no bottom could be

* It is also the *Clarence Island* of Capt. Foster, 1829, who seems not to have been aware that this name had been given to a principal isle of the group to the north-eastward.

found with 250 fathoms of line; and around all the islands the water was considerable. One island, in lat. 66° 20′, long. 66° 38′, has many bays; and forms, with the main land behind, a good harbour for shelter, but the bottom is rocky. No living animal was found on any of these isles, and not many birds, although only a few miles to the northward they were very numerous.

On the 21st of February, Capt. Biscoe succeeded in landing on the main land. The highest mountain in view he called *Mount William*, after his Majesty. The place was in a deep bay, in which the water was so still, that had any seals been found, the vessels could have been easily loaded, as they might have been laid alongside the rocks for the purpose. The depth of water was also considerable, no bottom being found with 20 fathoms of line almost close to the beach; and the sun was so warm that the snow was melted off all the rocks along the water line, which made it more extraordinary that they should be so utterly deserted. The latitude of Mount William appeared, from observation, to be 64° 45′, longitude 63° 51′.

Capt. Biscoe after this repaired to the South Shetland Islands, where he was driven ashore, lost his rudder, and very narrowly escaped shipwreck.

The northern point of what was considered as the main land by Capt. Biscoe was seen by him, at the distance of about 10 leagues, on the 27th of February, 1832; and the appearance of a range of islets, probably eminences on the main, continued in a north-westerly direction to the distance of 10 leagues further, and not remote from a spot previously visited by the *Chanticleer*, in lat. 63° 26′ S., and long. 64° 6′ W., January, 1829. To this point Capt. Foster imparted the name of *Cape Possession*, having here taken formal possession in the name of King George the Fourth. The coast, from the cape, takes a south-westerly direction, until lost to the eye on the horizon, where it appears to terminate in a mass of islands, of a bleak and dismal aspect, the same which were afterwards seen by Capt. Biscoe.

Early in the morning of the 5th of January, 1829, H.M.S. *Chanticleer*, from Staten Island, came in sight of *Smith's Island*, the westernmost isle of South Shetland. Fine weather of several preceding days was now succeeded by snow storms, which added not a little to the inhospitable appearance of the island. The vessel was also surrounded by icebergs; but with daylight, and no night, she was enabled to thread her course among them. The island was covered with snow, excepting on the sides of the precipices and the faces of the rocks, where it could not lie; and these, from their black appearance, presented a striking contrast with the high snow-clad land.

Capt. Weddell, in his notice of South Shetland, states that he was the first person who landed upon Smith's, by him called James' Island, the highest and most forbidding of all. The summit he estimated to be nearly 2,500 ft. above the level of the sea.

This island was seen, as above mentioned, by Capt. Foster, in the *Chanticleer*, who named its summit (now known as *Mount Foster*) *Mount Beaufort*,

in respect to Captain Beaufort, R.N., hydrographer to the Admiralty, &c. This summit he states to be about 6,000 ft. above the level of the sea, its centre in lat. 63° 2′ S., long. 62° 47′ N., and to have been seen at the distance of 85 miles.

Captain Foster adds, that the position of Mount Beaufort being tolerably well ascertained, may afford to those who, having met with adverse winds off Cape Horn, are compelled to pass its meridian to a high southern latitude, the means of ascertaining their longitude with tolerable precision, either by its bearing when on a known parallel, or by bearings from two stations sufficiently apart for that purpose, and connected by means of a self-registering log; and thus may be obtained the position of the ship.—*Webster*, vol. ii., p. 275.

On the 7th of January, 1829, after passing Smith's Island, the *Chanticleer* was coasting, with fine clear weather and an easterly breeze, the coast called *Trinity Land*, to the southward of South Shetland. It appeared to be of considerable extent, with mountains of 6,000 or 7,000 ft. in height, and covered with eternal snow. The day was fine, and numerous whales (fin-backs) were spouting up columns of water, and blowing about in all directions; while flocks of variegated petrels, or pintadoes, were circling around, and sedulously watching these leviathans of the deep for the purpose of obtaining some sort of food or aliment from their slimy exuviæ; and penguins innumerable were popping up their heads here and there, skipping and starting out of the water in the full enjoyment of their gambols. From the deck of the *Chanticleer* eighty-four large icebergs were in sight.

The first chart of these islands, for the use of navigators, was constructed by the late Mr. George Powell, commander of the ship *Dove*, and published by Mr. Laurie in 1822. In the composition of it, exclusive of his own observations and sketches, Mr. Powell was materially assisted by several intelligent commanders, both English and American, and he has added to the islands properly *South Shetland*, another group, considerably more to the East, which he discovered on the 6th of December, 1821. The latter lies between the parallels of 60½° and 60° 48′, and between the meridians of 44° and 47°. About it were innumerable icebergs and ice-islands. These isles appear in the chart under the name of *Powell's Group*, or *South Orkney*, and to the principal isle Mr. Powell imparted the name of *Coronation Island;* but *Pomona*, or *Main Land*, has since been proposed by Mr. Weddell as a more appropriate name.

Capt. Weddell has given an imperfect sketch of Powell's Group under the name of *South Orkneys*. These islands he fell in with on the 12th of January, 1823; and he describes their coasts as, if possible, more terrific in appearance than those of South Shetland; the tops of the islands, for the most part terminating in craggy towering peaks, which look not unlike the mountain tops of a sunken land. The loftiest of these summits, towering up to a point, in a clear day may be seen at the distance of 15 leagues.

By observations made on the 14th, it appeared that Saddle Isle, one of the easternmost islets of the group, lies in lat. 60° 37′ 50″, and long., by mean of three chronometers, 44° 52′ 45″. Mr. Powell placed this isle in lat. 60° 36′ S., long. 44° 32′ W.

Winds.—Nearly all the misfortunes that have happened in South Shetland have been in gales of wind from the eastward, which frequently prevail here, and blow with tremendous fury, generally accompanied with heavy falls of snow. No less than seven vessels have been lost, and all with easterly gales, excepting the *Clothier*, an American, which struck on a sunken rock.

In the years 1820, 1821, and 1822, nearly four-fifths of the gales were from the eastward; though we had all looked for harbours sheltered from the westward, being under the impression that we should have most to fear from that quarter.

In fine weather the winds from the S.W. and N.E. are about equal, not keeping long in either quarter. Indeed, with very few exceptions, the winds are always along the land, which renders this coast far less dangerous when under sail than it would otherwise be.

The South-westers here, much like the North-westers at home, are attended with a fine clear sky, and generally sweep away all the fog and sleet of the light North-westers. In two seasons I recollect only one gale from the N.W. which was very heavy. I was then in Blythe Bay, and it was perfectly smooth, though the sea outside was in a manner overwhelming.

It would appear, if a parallel may be drawn from these two seasons, that gales of wind on the land are very unfrequent. I have noticed that the wind on the land is generally light, with thick dirty weather; however, the gales of wind after the middle of February begin to increase in strength, and it is then not worth any one's while to stop longer on the coast. Were I bound round Cape Horn, and to meet with adverse winds, I would not keep hugging the wind, and going about with every slant, but check the topsail yards in, and keep my reach to the southward, when I should be sure to be not long without an easterly wind, with which I could soon get sufficient westing (the degrees of longitude being so short), and such an offing from the western part of Tierra del Fuego, as to make for me a S.W. wind a fair one.

The danger of falling in with ice is almost chimerical, there being no low drift ice on the North side of Shetland; and in two seasons I saw only three ice-islands.—*Capt. Robert Fildes*, of Liverpool.

Tides.—The tides on the North coast of South Shetland are very irregular, it being sometimes high water for twenty-four hours together; at others it flows tide and half-tide, and remains for about three or four hours high water, and then ebbs again; though there is, in general, one flood and one ebb every twenty-four hours. Gales of wind raise the tide sometimes much above its natural level; which may account, in some measure, for many skeletons of whales, which lie in many places 12 or 14 ft. at least above high-water mark,

and many yards from the sea-shore. In *Blythe Bay* (Desolation Island) I have frequently noticed an easterly gale to raise the water considerably above its common height; and the brig *Lady Troubridge*, of Liverpool, that drove on shore on Christmas day, 1820, was found in the next season, forced up nearly high and dry. This was on King George's Island.

Near the mouths of the straits the tides run very strong, and in various directions, which renders the navigation in light winds both unpleasant and unsafe. The flood tide on the coast sets to the eastward.

I have been informed that, when the brig *Williams* was on the survey, they found the current running always strong to the eastward. In a S.W. gale I have seen the tide run directly to windward, a full league from the coast, at the rate of 2 or 3 knots, and *vice versâ*, to the eastward again, when the brig *Williams* and the ship *Indian* were at once blown out of Blythe Bay with a gale of wind from the eastward. The *Indian*, which I was on board of, drove 10 leagues to the westward; and the *Williams*, though lying-to, drove up 7 leagues to the eastward, and dead to windward two-thirds of the way, which evidently showed that the two vessels had received the impulse of two contrary streams.

From all the observations which I have been enabled to make, I think the flood and ebb, in moderate weather, runs backward and forward in the offing as far as 2 leagues from the outer points of the land, taking the sweep of the bays; but, be it understood, that it sometimes runs much longer both ways, and likewise stronger than it does at others. Its distance from the coast always varies outside these limits. I have found the current run at least a knot, in the same direction as the wind blows.

From these remarks it will appear that it is not easy to give any satisfactory account of the tides, so as to reduce them to anything like a regular theory.

DECEPTION ISLAND.—The best harbour is formed by Deception Island (lat. 62° 56′, long. 60° 32′), which island, or *shell* of an island, is certainly one of the most singular productions of nature; the land is high, and bold on every side, with a narrow opening, of about a cable's length, on its S.E. side, leading to a very capacious basin. The isle is a volcanic production; its shores on either side are bold; and pumice-stone, with other substances, indicate its origin. There are several hot springs, some of which are of a temperature sufficient to boil an egg. The basin is 5 or 6 miles across. At its mouth you will have 3, 4, and 7 fathoms of water, and increase very rapidly as you enter; from 7 fathoms you increase to 10; then 18, 27, 32; and then a little within this you will get no bottom at 60 fathoms. On the N.W. side of the basin there is a very fine cove, capable of containing several vessels, in about 4 or 5 fathoms of water, and a bottom of good clay. From the entrance of the basin up to the cove the course is N.W. by W.

Deception Island was one of the pendulum stations of the late Capt. Foster, and a copious description of it is given by Mr. Webster, in his vol. i, pp. 144—165; and by Capt. Foster, in vol. ii, pp. 277—280. Its situation is lat. 62° 56′,

long. 60° 32′; and from the latter the longitudes of the other islands have been inferred.

The following remarks on Deception Island, &c., have been given from a journal of the expedition.

"Among ice-islands in a boisterous sea, attended with fogs, rain, and gales of wind, the little *Chanticleer* had no easy task to get to South Shetland. On the 10th of January, 1829, the Island of Deception was discovered, and a safe anchorage in the *interior* of it was shortly found. This island is justly entitled to its appellation, and is one of the most extraordinary productions of nature. Its formation is entirely volcanic, the principal part being composed of lava, ashes, and ice. The shores rise to an elevation of some hundred feet, particularly on the North side, which is considerably higher than the South; and being circular, of about 7 miles in diameter, it appears from a distance to be one large mass, from shore to shore. In searching for a harbour to receive the *Chanticleer* an opening was discovered, about 200 ft. wide, on its S.E. side; and on further examination, it was soon found that a large circular basin, of about 5 miles diameter, occupied nearly the whole *interior* of the island, the external shores forming a perfect barrier or wall, thereby affording the utmost security within. The depth in the centre of this basin was 97 fathoms, rather too much for anchorage, but a small cove on its eastern side gave ample security to the *Chanticleer*.

"The external as well as the internal shores of this island, from the friable nature of the materials, present some very remarkable appearances. The eastern side is entirely faced with cliffs of ice, about 300 ft. in height, which the constant washing of the sea forms into singularly fantastic shapes. Similar cliffs are also found on the South and S.W. sides, and their base is bounded by a beach of ashes and lava, which extends round the whole island at low water. The examination of the basin was attended with considerable difficulty, arising from the small ashes and dust which were carried into it from the island. Seals and their companions, penguins, and sea-leopards, were the only inhabitants found in this desolate island, which affords not the slightest verdure. Streams of water, at a temperature of 140° and 160° of Fahrenheit, were found issuing in some places from the sides of the hills, and running into the basin, the water of which was scarcely above the freezing point. It is generally supposed that this basin was formerly the crater of a volcano, and that the sea has found its way into it by washing out the narrow passage by which the *Chanticleer* entered. How long it has been resorted to by sealing vessels is unknown."

Bridgman Island.—Near the centre of the Shetland Group is *Bridgman Isle*, in lat. 68° 10′, long. 56° 40′, apparently another volcanic production. Captain Weddell, on passing within 200 yards of it, observed smoke issuing through the fissures of the rock, and apparently with much force. The figure

of the island is nearly round: it is very small, but 400 ft. in height, partaking of the form of a sugarloaf.

On advancing from the northward towards *Livingston's* or the *Main Island*, the land will appear in mountains of a vast height, and covered entirely with snow; their bases terminating in perpendicular ice-cliffs. The whole has an awfully grand, though terrific and desolate appearance; the snowy mountains showing themselves, one over another, far above the clouds.

On this side of the group, in lat. 62° 20′, long. 59° 50′, is a small isle, named *Table Island*, which is by far the most remarkable hereabout, and will always be an infallible mark for any one approaching, as it is not possible to mistake it for any other land. All strangers, therefore, should make this their landfall, particularly in the early part of the season, for then the land is not so easily made out, it having a great quantity of snow upon it, which may, at times, deceive those best acquainted. Its top appears as level as a bowling-green, and its sides resemble a wall. In the upper part of the N.E. end of it is a chink, or division, which may be seen from some situations.

Louis Philippe Land, Joinville Land, &c.—To the southward of the South Shetland group is the land discovered by the late Admiral D'Urville, of the French marine, and named by him as above. From a letter, addressed by him to the French minister, contained in the *Bulletin de la Société de Geographie de Paris* 1838, page 275, we copy the following notice of his exploration:—

"On the 27th of February, 1838, after a long stretch towards the South, through much ice, we came upon these mysterious lands; and in spite of the complicated obstacles against which we had to contend, both on account of the continued bad weather, and from the fog and ice, in the space of about 120 miles, between 63° and 64° South latitude. The land, which is crowned with immense peaks (Mount D'Urville is 3,060 ft. high), is covered by continual snows, of unknown depth. Were it not for the blackish rocks, rendered visible by the melting of the snows which form their limits on the coast, one would often be scarcely able to distinguish them from the numerous fields of ice which surround them. The principal of these places has received the name of Louis Philippe Land, in honour of the king, who first conceived the idea of making these explorations towards the South Pole. Other islands have received the names of various persons who have exhibited an active interest in our expedition, more especially of that illustrious statesman who arranged the plan of our voyage. Lastly, the mountains, capes, and islands, will recall the memory of the officers who took part in our dangers."

These distant and desolate regions were also visited and examined by the Antarctic Expedition under Sir James Ross, in December 27th, 1842, to January 30th, 1843. During this exploration many additional features, islands, capes, inlets, &c., were discovered and named. Interesting particulars are given in the account of Sir James Ross's Expedition, vol. ii, chap. 12.

PETER I. ISLAND.

The Island of the Emperor Peter I. was discovered by Capt. Bellingshausen in January, 1821. From the description he has given in his journal it is 8 leagues in circumference. He determined its lat. to be in 68° 57′ S., long. 90° 46′ W., and the height of the island to be more than 4,000 ft. Captain Bellingshausen's voyage was made in the Russian Imperial ships *Mirny* and *Vostok;* and the account of it, still in the untranslated Russian language, was published in the year 1819; we can, therefore, give no further account of this point, or of the island next described.

ALEXANDER I. ISLAND

was also discovered some days after the previous island by Capt. Bellingshausen. He determined the North point of this island to be in lat. 68° 51′ S., and long. 73° 9′ 46° W. The ships were prevented by the ice from approaching its southern point, and thus its position could not be determined.

These two detached portions of land may be presumed to form portions of the great southern continent; although the continuity has not been traced, yet certain indications lead to this. The southern part of Graham's Land, that is the portion of it seen by Capt. Biscoe in February, 1832, from Adelaide Island, is not above 100 miles distant from it, and this again forming a portion of the South Shetland range. The continent may be reasonably traced here through an extent of 250 leagues.

There is also reason to believe that the Islands of Peter I. and Alexander I. are connected by some hitherto undiscovered land; for Capt. Bellingshausen, in his traverse from one to the other, met with several signs of land, as, for example, some birds, which from their formation seemed to be land-birds, and he even perceived a change in the colour of the water. Now, although the vacancies remain hitherto unfilled, the later discoveries of Sir James Ross to the westward in such high latitudes lead to the inference that continuous land exists in those inaccessible regions. This inference has had greater weight since the discoveries recorded in the succeeding paragraphs.

ANTARCTIC LANDS.

On all the early maps of the world we find a *terra australis incognita* marked as surrounding the South Pole. This is one of the most ancient ideas of speculative geography, and its existence was supposed to be necessary to counterbalance the arctic lands. It was not until after the later voyages of Kerguelen, Cook, and others, that it entirely disappeared from our charts. The first of these navigators pushed to the southward, with the idea of determining its ex-

istence, and discovered, in 1772, the island now bearing his name. One of the great objects of the second voyage of our great navigator, Cook, was also the solution of the same problem, as explained in the introduction to the account of that voyage; and with this object Cook penetrated as far as lat. 71° 10′ S. on the meridian of 107° W., but without succeeding in his object. Some slight indications of the existence of land had been seen by him in lat. 61° 30′ S., long. 95° E. The result of these explorations led to the obliteration of these supposed lands from our representations.

The revival of the ancient speculations in recent times is due to the enterprise of the eminent and spirited merchants, the Messrs. Enderby, of London. A vessel despatched for the southern whale fishery, the brig *Tula*, commanded by Capt. John Biscoe, discovered the coast, lying on the antarctic circle, to the South of Madagascar, and to which the name of the munificent proprietors was attached. This is, however, beyond our present limits, nor have we included the land described in the preceding article, South of Cape Horn, which, as before alluded to, is very probably a portion of a much larger extent of land, perhaps connected with that to be described presently.

Between these southern lands, that is, to the South of Australia, and on and to the South of the antarctic circle, is a range, or *perhaps* a range of coast, the merit of the discovery of which has been the subject of angry disputation; but the order of discovery is summed up in few words. First, Capt. Balleny discovered the islands bearing his name, February 9th, 1839, and the spot which he considered to be land, Sabrina Land, March 2nd, 1839. Next, Captain D'Urville examined the Land of Adelie from January 19th, 1840, and the supposed Côte Clarie, February 7th, 1840. Third, Commodore Wilkes states that he saw what he *supposed* to be land January 16th, 1840, but did not verify his discovery until January 30th, 1840. Fourth in order is the exploration of the incontestable Victoria Land by Capts. James Clark Ross and Crozier in 1841-2. This will be presently described. It has even been stated that Capt. Wilkes did not put forth his pretensions until after his return to Sydney, on finding that the French had landed on January 22nd on the coast. The outlines of this painful controversy may be gathered from a paper by M. Daussy, in the Bulletin de la Société de Geographie, 2nde serie, No. 109. See, also, Sir James Ross's Account of his Antarctic Voyage; the Narrative of the United States' Exploring Expedition, vol. ii, chap. ix; some papers by M. Biot, in the Journal des Savants, November, 1848, pp. 672—687, and December, 1848, pp. 710—728, &c.

To the general navigator, these regions are of minor importance. In one view they are valuable. It would appear from the relations of D'Urville, Ross, and Balleny, that whales, chiefly of the fin-back species, were met with in some parts in abundance. The peculiarly hazardous nature of the navigation, surrounded by the immense icy obstacles, of course render their pursuit one of no

ordinary difficulty. The ever-changing character of the floating icebergs and fields partake of the usual features belonging to it in other regions.

BALLENY ISLANDS.

This is the earliest discovery, and, as before mentioned, was made by Capt. John Balleny in the schooner *Eliza Scott*, of 154 tons, accompanied by the dandy-rigged cutter *Sabrina*, Mr. H. Freeman, master, belonging to Messrs. Enderby, and well equipped for the enterprise. They quitted London on July 16th, 1838.

As this group is one of very considerable interest in the history of the antarctic lands, we will extract, with some abbreviations, the account of its discovery :—"February 9th, 1839—At 11^h a.m. noticed a darkish appearance to the S.W., lat. observed, 66° 37′ S. At noon saw appearance of land to the S.W., extending from West to about South ; ran for it, and at 4^h made it out distinctly to be land. At 8^h p.m. got within 5 miles of it, when we saw another piece of land of great height, bearing W. by S. At sunset we made them out to be three separate islands of good size, but the western one the longest. February 10th—At 2^h a.m. bore up for the middle island, and got within half a mile, but found it completely ice-bound, with perpendicular cliffs. February 11th—At 11^h a.m. the weather cleared ; saw the land bearing about W.S.W., and of a tremendous height, I should suppose at least 12,000 ft., and covered with snow. February 12th—At 6^h p.m. went on shore on Young Island, in the cutter's boat, at the only place likely to afford a landing; but when we got close with the boat, it proved only the drawback of the sea, leaving a beach of 3 or 4 ft. at most. Capt. Freeman jumped out and got a few stones, but was up to the middle in water. There is no landing or beach on this land; in fact, but for the barren rocks where the icebergs had broken from, we should scarce have known it for land at first. But as we stood in for it (Buckle Island), we plainly perceived smoke arising from the mountain tops. It is evidently volcanic, as specimens of stone, or rather cinders (scoriæ and basalt, with crystals of olivine), will prove. The cliffs are perpendicular, and what in all probability would have been valleys and breaches, are occupied by solid blocks of ice. I could not see a beach or harbour, or anything like one."

The group consists of five islands, three large and two small, the highest of which, named *Young Island*, was estimated by Capt. Balleny, as well as by his mates, at 12,000 ft. above the sea. It rises in a beautiful peak, which may be called Peak Freeman, as being on the island on which the commander of the cutter *Sabrina* landed. These islands and peaks were named respectively after Messrs. Young, Borradaile, Buckle, Sturge, Brown, Row, and Beale, the spirited merchants who united with Mr. Enderby in sending out the expedition. The easternmost, or *Sturge Island*, rises also to a peak, named *Brown's Peak*, but is not half the height of that on Young Island. Immediately off the centre, or

Borradaile Island, is a remarkable pinnacle of rock, called *Beale Pinnacle*, which rises like a tall lighthouse from the waters. The westernmost, or *Row Island*, is low, and offers no remarkable feature.

Another portion of the Balleny group was also seen by Capt. Sir James Ross, March 2, 1841. At first it appeared as two, but on the succeeding day as three islands. The northern one was named *Russell Peak;* the southernmost, *Smyth Island*, after the president of the Royal Astronomical Society; and the third was named *Frances Island.*

VICTORIA LAND.

This, the most southern known land, is the discovery of Capt. Sir James Ross and Commodore Francis R. M. Crozier, in January, 1841. The *Erebus* and *Terror*, having quitted Hobart Town on November 12, 1840, proceeded to the Auckland Islands and Campbell Island, and then advanced to the southward to reach the South magnetic pole. On January 11th land was seen ahead, and as the land is best described by Sir James Ross himself, we will extract some passages from his narrative.

The land rose in lofty peaks entirely covered with perennial snow; it could be distinctly traced from S.S.W. to S.E. by S. (by compass), and must have been more than 100 miles distant when first seen.*

The highest mountain of this range I named after Lieutenant-Colonel Sabine, R.A. It is in lat. 71° 42′ S., long, 169° 55′ E.

At noon we were in the highest latitude (71° 15′) attained by our great navigator in 1774, during his several attempts to penetrate to the South. We had by this time run 15 leagues directly towards Mount Sabine, and still it appeared to be very distant; more land came in view as we advanced, mountainous ranges extending to the right and left of that we first discovered. At 6 p.m., when we had closed the land 70 miles, we were about 2 leagues from the shore, which was lined with heavy pack ice. We steered close along the edge of it towards a small bay, where we hoped to effect a landing, but, the wind being on the shore, and a high sea beating heavily on the pack edge, we found it quite impracticable. The cape which forms the southern promontory of the bay was named *Cape Downshire*, after the late marquis. Its northern point was called *Cape Adair*, after Viscount Adair, lat 71° 18′, long. 170° 45′ East. It is a remarkable projection of high, dark, probably volcanic, cliffs, and forms a strong contrast to the rest of the snow-covered coast. Some rocks that were observed to lie several miles to the North and West of Cape Adair,

* The northern point seen of the Victoria Land was passed on the return of the vessels in 1841, and was named *Cape North;* a low point, with three projecting knobs, like the tops of mountains, was seen at a great distance beyond Cape North, whence the land trends considerably to the South of West, but a dense body of ice prevented them following the coast any further.

showing their black summits conspicuously amongst the white foam of the breakers, were named *Dunraven Rocks*; we obtained soundings in 165 fathoms, and several small black stones, which came up with the lead, tended to confirm my conjectures of the volcanic origin of the newly discovered land. Cape Adair at the time bore N. 52° W., distant about 5 or 6 miles. It was a beautiful clear morning, and we had a most enchanting view of the two magnificent ranges of mountains, whose lofty peaks, perfectly covered with eternal snow, rose to elevations varying from 7,000 to 10,000 ft. above the level of the ocean. The range of mountains extending to the N.W., was called Admiralty Range.

The dip had increased to 86°, and the variation amounted to 44°. These observations place the magnetic pole in lat. 76° S., long 150° 20′ E., therefore in the S.W. (*true*) from us, and distant above 500 miles. But the land interposed an insuperable obstacle to our direct approach to it, and we had to choose whether we should trace the coast to the N.W., with the hope of turning the western extreme of the land, and thence proceed to the southward; or follow the southerly coast line round Cape Downshire, and thence take a most westerly course.

The ceremony of taking possession of these newly discovered lands, in the name of our most gracious sovereign Queen Victoria, was immediately proceeded with. The island was named *Possession Island.* It is situated in lat. 71° 56′, and long. 171° 7′ E., composed entirely of igneous rocks, and only accessible on its western side.

January 15, 1841.—Early this morning we had a fine view of a magnificent chain of mountains that we had seen stretching away to the southward some days before. These mountains were also completely covered to their sharply-pointed summits with snow, and the elevations, that were measured roughly, varied from 12,000 to 14,000 ft. They were named after the eminent philosophers of the Royal Society. Observations placed us at a distance of 90 miles from the mountains, which we still saw clearly.

January 19.—At four o'clock in the morning we had 170 fathoms; at eight, 210 fathoms; and at noon the depth of water increased to 270 fathoms, although we had closed the land more than 40 miles since midnight. Coulman Island, which we had only seen by refraction, now formed the southern extreme point in view, and a new range of mountains was observed stretching away to the S.W. from Mount Northampton, forming a kind of crescent-shaped ridge. A remarkable conical mountain to the North of Mount Northampton was named *Harcourt;* another, *Mount Lubbock*, to the southward of Mount Brewster; and two other mountains still further to the southward, *Murchison* and *Phillips.* Making all sail to the South, steering direct for Coulman Island, which still formed the eastern extreme of land in sight, having a broad passage between it and the main land, a deep bight was observed to the southward of a remarkable cape, high, black, and cloven at the top, further to the North,

Cape Wheatstone, the right-hand point of an apparent inlet, had the whole of its precipituous face quite clear of snow, though it thickly covered its rounded summit. Soon afterwards we perceived that the ice extended from the North Cape of Coulman Island *(Cape Wadworth)* several miles to the northward, and the whole space between it and Cape Jones was filled with a solid field of ice that appeared as if it had not broken up this season. We sounded in 320 fathoms, the deep sea clams coming up full of a stiff green mud, sand and small stones, some fragments of star fish, and pieces of coral. A strong ripple indicated a tide or current, and we found the ship was drifting to the South, by the lead and bearings of the land, at the rate of three-quarters of a mile per hour.

We stood off; and on standing in again land was distinctly seen; a high peaked mountain, bearing true West, was named *Monteagle*; and one of very great elevation, the highest by estimation we had yet seen, was named *Mount Melbourne*, the form of which had a general and striking resemblance to Mount Etna, but its elevation must be very much greater. The land ice, although not more than 4 or 5 ft. above the surface, blends so imperceptibly with the snow that descends from the mountains, and extends far into the sea, that it was impossible to form any idea of the exact position of the coast line. To the N.W. the space between Coulman Island and the main land was occupied by a similar kind of land ice, that appeared not to have been broken away for many years.

The icy barrier proved a sufficient obstacle to any attempt to reach the magnetic pole.

In their further progress to the southward, that is, to the South and East of Coulman Island, they had seen but very few whales, which was the more remarkable on account of the very great numbers they met with not more than 60 or 70 miles to the northward.

Franklin Island, which was reached January 27th, is in lat. 78° 6′ S., and long. 168° 12′ E. It is 12 miles long and 6 miles broad. The northern side presents a line of dark, precipitous cliffs, 500 or 600 ft. high. Not the smallest trace of vegetation was visible—not a lichen or piece of sea-weed on the rocks. A high cliff of ice projects into the sea on its South and West sides, and renders it there quite inaccessible; and a dangerous reef of rocks extends from its South cape 4 or 5 miles. We stood to the southward close to some land which had been seen since the preceding noon, and had then been called High Island. It proved to be a mountain, 12,367 ft. high, emitting flame and smoke in great profusion. The discovery of an active volcano, in so high a southern latitude, cannot but be esteemed a circumstance of great geological importance and interest: I named it *Mount Erebus*, in lat. 77° 33′ S., long. 166° 58′ E.; and an extinct volcano to the eastward, little inferior in height, being by measurement 10,884 ft., was called *Mount Terror*.

The seat of the southern magnetic pole, upon which it was the most anxious

wish of the commander to plant a flag, as he had done on that of the northern hemisphere, must be in some very lofty mountain to the westward of this portion of the vessels' tracks. The coast in front of them, for they were very distant, was not seen. They were named the *Prince Albert Mountains.*

A small, high, round island, which had been in sight all the morning, was named *Beaufort Island* (lat. 76° 55′ S., long. 166° 58′ E.), after the great hydrographer. At the foot of these two volcanoes the only two conspicuous headlands are separated by a bay of inconsiderable depth. The western promontory was called *Cape Bird;* the easternmost, *Cape Crozier;* after the officers and esteemed friends of the commander. To the eastward of Cape Crozier a remarkable vertical wall of ice extended from 150 to 200 ft. high, over which some distant mountains could be seen extending to the South from Mount Terror, and named *Parry Mountains.* Along this solid and impenetrable barrier they sailed to the eastward. From its height above the surface it must have been more than 1,000 ft. in thickness; and this immersion had a most magical effect in quieting the undulations of the sea. On February 2nd, they attained the highest latitude gained that season, 78° 4′ S., and 250 miles from Cape Crozier. In the next season this mighty barrier was traced for above 450 miles distant from the same point, maintaining the same unvarying character.

We will conclude this most imperfect series of extracts on this interesting region with the following remarks of Captain Ross:—"I have no doubt but that these seas, in the summer season, might be penetrated to a great distance; and it is very probable that eventually the South magnetic pole will be attained by persevering to the S.W. through the vast track of ocean which separates Victoria Land from the Balleny and other islands or lands, discovered near the antarctic circle, by Biscoe, Balleny, Wilkes, and D'Urville, We saw a great many whales whenever we came near the pack edge, chiefly of a very large size; and I have no doubt that, before long, this place will be the frequent resort of our whaling ships, being at so convenient a distance from Van Diemen's Land, which affords every means and facilities for their equipment; and thus we may hope to become, by degrees, through their exertions and enterprise, better acquainted with this part of the antarctic region, which the setting in of the winter so much earlier than we expected had prevented our accomplishing so satisfactorily as we wished."

ADELIE, CLARIE, SABRINA LANDS, ETC.

We again return to the northward, and then proceed to the westward along the line of the icy barrier, which has been passed by the English, the French, and the American navigators, as described in the introductory remarks to this section of our work. Within this barrier lies the continent, or land,

which has been the subject of so much disputation. We shall not again enter into this, but briefly extract what each navigator has said concerning his progress, and thus beginning first to the westward of Balleny Islands.

Ringgold's Knoll is the first discovery which is claimed in the "Narrative" for the United States' squadron, vol. ii., p. 292. This, it is there stated, was made on January 16, 1840. They saw "over the field ice an object, large, dark, and rounding, resembling a mountain in the distance; the icebergs were all light and brilliant, and in great contrast."—"The mountains could be distinctly seen over the field ice and bergs, stretching to the S.W. as far as anything could be discerned. These eminences must be from 1,000 to 2,000 feet high."

Cape Hudson was seen by the *Peacock*, January 19, 1840, far beyond and towering above an ice island that was from 150 to 200 ft. in height. It bore from them about S.W., and had the appearance of being 3,000 ft. in height. To the West of it was an inlet into the main body of the ice, named Peacock's Bay. Off its West Point, called Point Emmons on Wilkes' chart, the *Vincennes* passed a remarkable collection of tabular icebergs, for whose existence they could account in no other manner than by supposing them to be attached to a rocky islet which formed a nucleus to which they adhered. To the West of this group again a deep indentation was called *Disappointment Bay*, in lat. 67° 4′ 30″ S., long. 147° 30′ E. *Piners Bay*, to the westward of this again, was made to be in lat. 66° 45′ S., long. 140° 2′ 30″ E. Here the ships approached within half a mile of the dark volcanic rocks, which appeared on both sides of them, and saw the land gradually rising beyond the ice to the height of 3,000 ft., and entirely covered with snow. It could be distinctly seen extending to the East and West fully 60 miles. Although no mention whatever is made in the American narrative of the fact, this Piners Bay must have been the same land as that *landed on* by the French on January 21st previously.

Adelie Land.—On December 12th, 1839, two French corvettes, the *Astrolabe* and *Zelée*, with their crews sadly reduced, and in a deplorable state of health, cast anchor at Hobart Town. They had left Toulon under Dumont D'Urville, and Jaquinot, on September 7th, 1837. After a short respite, they again started on their perilous enterprises, and sailing due southward by compass, on the 19th of January they descried land, but caution led them to defer judgment until the 20th, when all doubts were dispelled. On the 21st they saw the land not more than 3 or 4 miles distant. It extended from N.E. to S.W., and beyond the limits of vision. It was from 3,500 to 4,000 ft. in height, entirely covered with snow, which showed in ridges like the sands of the desert. No part of the ground was visible, and only its great elevation was an evidence that it was not a vast bank of clouds. During the close examination of this interesting land, the summits of some black pointed rocks were perceived; this was the signal for the boats to advance, and they

accordingly landed from both ships, and took possession January 21st, 1840. The land was named by Capt. D'Urville after his wife, *Terre Adelie*. They escaped from the dangerous labyrinth; and on the 29th a sail was perceived, which, by its colours, was seen to be an American man-of-war; it was the United States' exploring ship the *Porpoise:* and then occurred the incident which has been so differently related by the two commanders. The ships passed without speaking to each other; perhaps it so best suited the American.

Clarie Coast (Côte Clarie) was inferred to exist by D'Urville from induction only. On his approach, January 30th, 1840, he states that before him was an immense wall of ice, continuous, without fissures, and from 100 to 150 ft. in height. He coasted along it for 20 or 25 leagues, without finding a termination. From being so close to these icy cliffs he was unable to see if there was land beyond them. They only presented the fact from which it might be presumed that this boundary of ice, so solid and so extensive, could not be formed and maintained with such continuity, without resting against some great land. This supposition is never expressed but with this reserve; and in his chart of 1840, D'Urville marks it as "ice cliffs, steep and uniform, *supposed* to envelop a solid base."

Sabrina Land, the part under consideration, was thus named by Captain Balleny after the cutter which accompanied his vessel. His journal says:—"March 1st, 1839:—Standing to the westward, passed several icebergs and numerous flocks of penguins, petrels, and mutton-birds. March 2nd:—Strong winds; saw a great many birds. At noon, lat. obs. 64° 58′, long. 121° 8′ E. At 8 p.m., the water becoming smooth all at once, hove to. *Saw land to the southward*, the vessel surrounded by drift ice."

Knox's High Land, of the United States' Exploring Expedition, was approached on February 14th, 1840. The longitude at noon was 106° 18′ 42″, lat. 65° 52′ 40″ S.; variation, 57° 5′ W. The extent of coast in sight was 75 miles, and, by approximate measurement, 3,000 ft. high. It was entirely covered with snow. On running in for the land, several icebergs, greatly discoloured with earth, were passed, and they landed on one of the largest. In it were embedded, in places, boulders, stones, gravel, sand and mud, or clay. The larger specimens were of red sand stone and basalt. There was no doubt but that it had been detached from the land about 8 miles distant.

The *Vincennes* then coasted along the icy barrier to the N.W. and West, passing a vast number of whales and sea-birds on and around all the icebergs. The western extreme attained was in a large bay in the barrier, which was named *Repulse Bay*, long. 97° 37′ E., and lat. 64° 1′ S.; variation, decreasing, 56° 21′ W. Appearances of land were also seen to the S.W., and its trending seemed to be to the northward. It is called *Termination Land* on the American chart. Hence the barrier trends to the northward, and was not traced to the westward by the United States' Expedition. But it may be ob-

served, that Capt. Cook found the ice and evidences of land in about lat. 61° 30′ S., long. 95° E., in February, 1773.

This concludes the description of the lands, which may be properly said to form the southern bounds of the Pacific. From the field its discovery may have opened to our whale-fishers, and the great interest attached to it in a scientific light, it certainly is most important, and deserves a larger notice.

DETACHED ISLANDS BETWEEN LATITUDE 40° AND 60° S.

Between the western coast of South America and New Zealand, and the vast groups of coral islands forming the Low Archipelago, and other similar collections of minute spots of dry land to the North, and the eternal ices which enclose the land or the sea about the South Pole, we have an immense expanse of ocean, in which, as far as has been hitherto discovered, no portion of the earth's surface rises above the level of the waters; so that the mariner, in traversing this immense extent, comprising more than 110° of longitude, and 45° of latitude, has no fixed point to direct him as to his exact position, other than those drawn from the heavens. The only group stated to exist, which was discovered by the *Nimrod*, seems to be of very doubtful character.

In proceeding from the eastward, it is not until we reach the vicinity of New Zealand that we encounter any lands; and these consist of a series of small isolated rocky groups, which are arranged in a general N.E. and S.W. direction, rearing their rugged peaks to some height, but at considerable intervals from each other. Upon reference to the chart it will be seen that they form a line of islands parallel to the general trend of the New Zealand range of mountains, and also the principal mountain ranges of New South Wales. There may be some connection between these conformities, and the character of their geological formation tends to the same conclusion. Most, if not all, of these islands are of volcanic formation. New Zealand is eminently so, as will be shown hereafter. With this view it may be considered that, should any fresh discoveries be made, they will lie in this general line. From these waters being now so much traversed, however, this is scarcely probable.

Following the principle we have set out with, we commence with the southernmost and easternmost of the groups.

DOUGHERTY ISLAND.

Dougherty Island, one of the most isolated spots in the ocean, being in the most open space of the great world of waters, was supposed to have been seen by a whale ship, the *James Stewart*, Captain Dougherty, on the 29th of May, 1841, and is unconnected with any other known system. It appeared to be an island 5 or 6 miles in length, running N.E. and S.W.; with a high round

bluff on the N.E. end, with low land to the S.W.; between the N.E. and S.W. ends there appeared a valley covered with ice and snow. He passed it within a quarter of a mile, going at least 10 knots. The position was only gained approximately; lat. 59° 20′ S., long. 120° 20′ W. Its character and the circumstance of its not having been again encountered, led to the inference that it was an ice-berg.

But it has again been seen, and therefore its existence may be said to be confirmed.

Capt. E. Keates, of the *Louise*, of Bristol, on his passage from Melbourne to St. John, New Brunswick, on the 3rd of September, 1859, passed two icebergs; and on the 4th discovered a round island, about 80 ft. high, of a *dark colour*, with a large iceberg aground on the N.W. side of it. "From the appearance it was thought that the ice had driven on or foul of it, as the prevailing winds were from the N.W. The S.W. end of the ice was low, the N.E. very high, and lying broadside to the wind. I mention these circumstances more particularly, as I saw several icebergs, and every one of them with the low part to the wind's eye, and the high end to leeward, which, I think, will confirm the opinion that the above-named must be land." Capt. Keates's good observations place it to the eastward of Capt. Dougherty's approximate position, and in lat. 59° 21′ S., long. 119° 7′ W.

NIMROD ISLANDS.

A group of islands stated to have been seen by Capt. Henry Eilbech, in the ship *Nimrod*, in 1828, on her passage from Port Jackson to Rio Janeiro, round Cape Horn. They were placed by him in lat. 56½° S., long. 158° 30′ W., and appear to have been seen at a considerable distance; although numerous birds and amphibious animals, with a great quantity of marine vegetables found in the vicinity, indicated their real existence.

Capt. Biscoe sought for the group in 1831, but the search was ineffectual. This may arise from the variation of the positions given. The latter stated them to be in lat. 56° 3′, long. 157° 50′, which, should the first-named be correct, would not certainly disprove their existence. The water here, however, looked discoloured, as though on a bank, but no soundings could be obtained. On January 14th, 1832, in lat. 56° 26′ S., long. 156° 48′ W., many birds were seen, and much sea-weed was floating about.

Emerald Island (?).—This supposed island, in lat. 57° 15′ S., long. 163° E., was announced by Capt. C. J. Nockells, to whom the nautical world is indebted for several useful observations in the Atlantic. The following extract from a communication to Mr. Purdy will explain all:—"At 11 a.m. on the 13th of December, 1821, in the ship *Emerald*, lat. 57° 30′ S., long., by chronometer,

162° 12′ E., we saw the resemblance of an island bearing E. by N., about 25 miles distant. It appeared very high, with peaked mountains. Direction, N.E. and S.W., *about* 30 miles."

The supposed site of Emerald Isle (lat. 57° 15′ S., long. 162° 30′ E.) was passed by the United States' Exploring Expedition, January 9th, 1841, without seeing it or any other indication of land. It was therefore inferred not to exist in the locality laid down.

MACQUARIE ISLAND.

This island was discovered in the early part of the present century by a colonial vessel, and received the name of the governor of New South Wales, a name which has been sufficiently distributed in many parts of this region. It is stated that the discoverers left a party on it, and the persons employed in shooting killed not fewer than 80,000 seals. It was visited, April, 1811, by Mr. T. Garbutt, in the brig *Concord*, and again in February, 1812, and at both periods found the winds and surf very strong. On both occasions his ship drove, and on the second his boat was upset in the surf, and it and all hands lost. Capt. Bellingshausen, of the Russian navy, visited it in 1820, and Lieut. Langdon, R.N., in 1822; both of these officers have given charts of the island, but they differ considerably from each other. According to the English chart, it is 38 miles in extent from North to South, and its North extreme, called *North Head*, is in lat. 54° 19′ S., long. 158° 56′, and its South end in lat. 54° 56′. According to the Russian surveyor, it is but 19 miles in extent, and its centre in lat. 54° 39′ S., long. 158° 41′ E. Agreeably to this the North point is 11′ South of that given by Lieut. Langdon. But these observations may be considered as superseded by those of the United States' Exploring Expedition hereafter noticed.

Both the English and the Russian descriptions agree in giving it a breadth of 5 or 6 miles throughout. On the English chart, soundings of from 10 to 90 fathoms are marked out all along the eastern side at the distance of 3 miles off shore; also two anchorages, but which are open. The northernmost of these bears the name of *Buckle*, *Bayster*, and *Buchanan Bay;* the other, 6 miles from the South point of the island, is called *Lusitania Road.* The North point is surrounded by rocks, which are named *Elliot Rocks* on the chart.

The South end of this island is placed by Capt. Wilkes, of the United States' Exploring Expedition, in lat. 54° 44′ S., long. 159° 49′ E. Off this end a reef of rock extends for three-quarters of a mile. The island is high and much broken; it is apparently covered with verdure, although a long tufted rank grass was the only plant seen by those who landed.

The highest peak on the island is from 1,200 to 1,500 ft. high; and as far as the observations of the United States' Exploring Expedition extended, it

had neither tree nor shrub on it. It affords no inducement for a visit, and apparently no suitable place for landing with a boat. A party landed with great difficulty, through the tremendous surf, in an indentation on the West side, and found it tenanted with countless myriads of sea-birds, penguins, and albatrosses.

The Bishop and his Clerk are some islands or rocks which lie to the southward of Macquarie Island, according to Capt. Bellingshausen, in lat. 55° 15′ S., long. 159° 0′ E.; but if the American longitude be correct, it must be placed more than a degree further to the East.

The Judge and his Clerk, two large naked rocks, lie about 24 miles N. 20° E., *true*, from the North end of Macquarie Island; or, according to Bellingshausen, in lat. 54° 22′ S., long. 158° 46′ E.; the latter subject, however, to the same question as raised in the previous instance.

CAMPBELL ISLAND.

This island was discovered by Capt. Fred. Hazelburgh, of the brig *Perseverance*, belonging to Mr. Robert Campbell, of Sydney, in 1810. According to his account, the island is 30 miles in circumference; the country is mountainous; and there are several good harbours, of which two on the East side are to be preferred. The southernmost of these two he named *Perseverance Harbour*, and in it Sir James Ross anchored in the *Erebus* and *Terror*, December, 1840.

The highest hill seen from the harbour is on its North side, and has an elevation of 1,500 ft. The shores on either side are steep, and rise abruptly to between 800 and 900 ft. The hills, from being less wooded, have a more desolate appearance than those of the Auckland Islands; and though there is abundance of wood in the sheltered places, the trees are nowhere so large as in those islands. These trees especially indicate, by their prostrate position, the prevailing power of the westerly storms. This occurrence of sudden and violent rushes of wind is a remarkable characteristic phenomenon of all the islands about this latitude. It is observed at Kerguelen Land, at Auckland, and especially here.

Sir James Ross had been advised at Van Diemen's Land to take his ships into the harbour near the N.E. point, but from the entrance it appeared so exposed to winds from that quarter, that he bore away for the southern harbour.

Perseverance Harbour is about 4 miles in depth, running for more than 2 miles in a W.N.W. direction; and thence, after passing a shoal point, with a warning bed of seaweed off it, on which the *Terror* grounded, about W.S.W. to its head. The shoal on the North shore, north-eastward of Terror Shoal, is plainly marked by kelp.

In the outer part of the harbour the water is too deep for convenient an-

chorage; but in the upper part, which is completely land-locked, there is abundant room for a hundred ships to lie in the most perfect security, and excellent water can be had in any quantity. The observation spot on the beach, near the shoal point, was found to be in lat. 52° 33′ 26″ S., and long. 169° 8′ 41″ E., dip. 73° 53′. It was high water, on full and change, at XII^{h}, but presenting the same irregularities as at Laurie Harbour, Auckland Isles. The rise and fall, at neaps, was 43 inches.

H.M.S. *Cossack* anchored here in February, 1873, in 10 fathoms, with Beeman Hill N.W. ½ N. During her three days' stay it blew hard from North to N.N.W., ending in S.W., heavy squalls coming down from the hills; in one of these the ship dragged her anchor; so shifted berth farther out, anchoring in 12 fathoms, with Beeman Hill N.W. by W. ½ W.

After leaving, and when about 10 miles distant from the land, with the N.E. point of the island bearing W. by N., the S.W. point S.W. ½ W., and Erebus Point S.W by W. ½ W., the entrance to the harbour was immediately under what appears to be the highest part of the island.

There is a depôt of provisions, kept up by the New Zealand Government for the use of shipwrecked mariners, in Tucker Cove, Perseverance Harbour, the position of which is marked by a staff. No pigs were seen, but geese and wild duck were seen at the head of the harbour.

It was from the shores of this harbour that the French expedition observed the transit of Venus in 1874.

North Harbour, or Penguin Bay, on the East side of Campbell Island, may be known by Cossack Rock, a small round island which lies off the North point of the entrance; the bay extends to the westward for 3 miles, and increases in width towards the head, terminating in two creeks, the southern of which inclines to W.S.W. At the head of the bay is a fine valley, through which runs a considerable stream of water, the largest in the island. Vegetation appears more healthy here than elsewhere on the island, on account of it being less exposed to westerly winds. Penguin Bay is easier of access than Port Perseverance, and easterly winds seldom blow there; it seems more frequented than the other anchorages by the whalers, of whom there are many traces. There is anchorage in all parts of the bay, the depth being from 5½ to 8½ fathoms.

The western side of Campbell Island has a desolate and storm-beaten appearance, and the only bays, Boat Harbour and Monument Harbour, afford no shelter. H.M.S. *Cossack* noticed several isolated rocks, about 300 ft. high, off the N.W. point of the island, and off the S.W. end another remarkable isolated rock 600 ft. high. Within these rocks are other small detached rocks, one of which, lying N.W. from the S.W. islet, has the appearance of a cloaked figure on a pedestal, and probably supplies the name of Monument Harbour to the indentation in the coast near it. The rocks were passed at 2 miles distance, and no outlying dangers seen.

AUCKLAND ISLANDS.*

The first knowledge of this group is due to the commercial enterprise of British merchants. They were discovered by Capt. Abraham Bristow, in the ship *Ocean*, a vessel belonging to the late Samuel Enderby, Esq., during a whaling voyage, August 16th, 1806. This was in his third voyage round the world, and the following extract from his log-book, quoted by Sir James Ross, announces the discovery :—" Moderate and clear ; at daylight saw land, bearing West by compass, extending round to the North as far as N.E. by N., distant from the nearest part about 9 leagues. This island or islands, as being the first discoverer, I shall call *Lord Auckland's* (my friend through my father), and is situated, according to my observation at noon, in lat. 50° 48′ S., and long. 166° 42′ E., by a distance I had of the sun and moon at half-past ten a.m. The land is of moderate height, and from its appearance I have no doubt but it will afford a good harbour in the North end, and I should suppose lies in about the latitude of 50° 21′ S., and its greatest extent is in a N.W. and S.E. direction. This place, I should suppose, abounds with seals, and sorry I am that the time and the lumbered state of my ship do not allow me to examine it."

Capt. Bristow visited them in the following year, 1807, in the *Sarah*, also belonging to the Messrs. Enderby, when he took formal possession of them for the British crown, and left some pigs there, which afterwards increased to a surprising extent.

The islands remained untenanted during the subsequent years, being visited occasionally by vessels in search of whales and seals, the former coming into the bays to calve, during the months of April and May, and the latter consisting chiefly of sea-lions.

In the year 1840 it was visited by the vessels of three nations—the English ships *Erebus* and *Terror*, under Sir James Ross and Capt. Crozier ; the French corvettes, *L'Astrolabe* and *La Zelée*, under Dumont D'Urville ; and the United States' Exploring Expedition. From the narratives of these voyages we have chiefly derived the subsequent particulars.

They were, as above mentioned, without permanent inhabitants during all the periods of the above visits ; but subsequently a body of New Zealanders,

* Between the Macquarie and Auckland Islands, which apparently lie in the same line, or continuation of the volcanic ranges of New Zealand, a submarine earthquake was apparently felt on board the ship *Orient*, from Adelaide, Capt. Harris, on November 17th, 1865, at 7.15 a.m., in lat. 51° 44′ S., long. 160° 49′ E. Weather fine. The ship commenced trembling violently, as if she were passing over a rough bottom, in shallow water ; at the same time the bells began to ring. The violent trembling lasted two or three minutes, with nothing visible, and no bottom with the deep-sea lead. All on board concluded that it was the effects of a submarine volcano.

about seventy in number, came over from Chatham Island in a whale-ship, and were landed on the N.E. or Enderby Island. Bringing with them their warlike spirit, their quarrels soon led to an outbreak, and some fighting and loss of life ensued.

From the eminent services rendered to geographical science, and to further those commercial enterprises in which the Messrs. Enderby, for several generations, had so largely engaged, the group was granted by the British government to Messrs. Charles, George, and H. Enderby; and on the formation of the Southern Whale Fishery Company, Mr. Charles Enderby took possession of his domain in the early part of 1850, finding the New Zealanders before mentioned in possession of a portion of the land. But the company was not successful, and after a few months the colony was abandoned, and there have not since been any permanent inhabitants. This, then, is the brief history of this remote island, which promised to become a most conspicuous point in the wide world of waters which this book describes. Of late years the group has risen into undesirable importance from the reported wreck of several vessels, which, pursuing courses in high latitudes in the Australian voyage, have encountered its stormy shores.

Though the group has been visited by the four principal navigators before mentioned, we have but an imperfect notion of the entire group, even as regards its dimensions. For from the cursory examinations made by Mr. Enderby, it would appear that the island must be considerably broader than is represented on D'Urville's chart. Of course, the very imperfect sketch given by Bristow cannot be taken as giving a correct idea of the island.

Mr. M'Cormick, the naturalist to Sir James Ross's Antarctic Expedition, remarks that the formation of the Auckland Islands, as well as Campbell Island, is volcanic, and constituted chiefly of basalt and greenstone. He also calls attention to *Peas Head*, in Laurie Harbour, North of Shoe Island, as being of great geological interest, exhibiting fine columns, 300 ft. high, which are highly magnetic. The loftiest hill *Mount Eden*, at the head of Laurie Harbour, attains an elevation of 1,325 ft., is rounded at the top, and clothed with grass to its summit.

Provisions.—Depôts of provisions have been established by the Colonial Government of New Zealand, for the benefit of shipwrecked people, at the following places:—South side of Erebus Cove; Sandy Bay on Enderby Island; Saddle or Norman Inlet; and at Carnley Harbour. Numbers of rabbits were seen on Enderby Island in 1873, at the time of the visit of H.M.S. *Cossack*, but no ducks there or at Port Laurie. Rock cod were caught in February, 1873, off these islands by the crew of H.M.S. *Blanche;* their bodies were then found full of worms, but at other seasons of the year these may disappear, and the fish be good for food.

Water, as an article of consumption, is very abundant. The stream which falls into the head of Laurie Harbour had sufficient water to form a noble

cataract after a month's dry weather, and indeed abundance of streams are to be met with at all parts. The nature of the soil is such that, whatever quantity of rain falls, it very quickly sinks below the surface, and then probably percolates away on the volcanic and impervious rocks beneath. From the moisture of the climate, and the igneous character of the rocks, this peaty formation arises. Great difficulty was found in forming a foundation for the observatory at the time of the *Erebus* and *Terror's* visit; they had to dig 12 ft. through the peat to gain the solid rock on which to erect the instruments.

The magnetical observations made here were found to be singularly affected by the nature of the island. These phenomena lead to the opinion that the island may be taken as one great magnet itself.

Climate.—No very accurate knowledge of the general climate of the group has been yet acquired. It has been supposed to be similar to Chiloe, which has been described in a former page of this work. To this, therefore, the reader is referred. But it is also very probable that that account, to coincide with these islands, must be somewhat modified in one particular—the strong winds to which it would appear they are subject. The trees are an evidence of this, as they bend from the general western direction of the violent squalls. Mr. Enderby experienced one very remarkable phenomenon, in the early part of 1850, at the station in Port Ross. A most violent gust of wind struck, with the force of a solid body, the spot near where he was, and this not for any continuous period, or over an extended space, but only for about five seconds of time and a few yards in diameter. After passing onward the percussions of the repeated shocks could be heard at short intervals as it went. There was no apparent cause for it, and the intervening spaces were comparatively calm. This is a very important consideration with vessels unprepared for such a visitation when at anchor, and it is probable that many accidents, including that to the *Grafton*, schooner, may be attributed to this.

The Auckland Group, according to Sir James Ross, consists of one large and several smaller islands, separated by narrow channels. The largest island he states to be about 30 miles long, and 15 miles in extreme breadth; but this cannot be considered as exact, as before mentioned. It contains, he continues, two principal harbours, whose entrances are both from the eastward, and whose heads or termination reach within 2 or 3 miles of the western coast.

ENDERBY ISLAND is the north-eastern island of the group, and forms the northern side of the entrance to Laurie Harbour, or Port Ross. It is 2½ miles long East and West, and every part of the island is densely covered with vegetation. Some trees are 70 ft. in height, though generally from 15 to 20 ft. Numerous small birds of three or four species. The island is not high, and is well supplied with water. It is upon this island that the principal portion of the stock landed by the Whale Fishery Company was kept. They immediately began to improve in their new position, an evidence of the good quality of the

land. One portion of the New Zealand tribes was established here, and raised vegetables, turnips, potatoes, cabbages, &c.

As is frequently the case, the tidal currents meet off Enderby Island; and on this Sir James Ross says:—"On rounding the N.E. cape of Enderby Island we passed through some strong whirlpools, occasioned by the meeting of the tides off the point; and although we did not find soundings with our ordinary hand lines, it is by no means improbable that some shoals or rocky patches may have some influence in producing these strong and dangerous eddies."

Laurie Harbour, or *Port Ross*.—Captain Bristow, the discoverer of these islands, who also drew the first sketch of the group, named this, the principal harbour, Laurie Harbour, after the gentleman who first issued this knowledge to the world in 1810. On a chart of the Western Pacific, by Capt. Butler, and published by Mr. Laurie, this sketch will be found. There are two surveys of this excellent harbour, the one by Sir James Ross, the other by Admiral D'Urville. That of the latter is the most complete, and exhibits more in detail the character of the locality.

The entrance to the harbour is between Enderby Island on the North side, and *Green Island*, or Ewing Island of Sir James Ross, their distance apart being rather above a mile. A shoal extends about half a mile from the S.W. part of the latter island. The passage between Ewing and French Islands is not recommended.

Dundas and *Green Islets*, 1½ mile apart, and connected by a reef, lie 1¾ mile S.E. of Ewing Island, on the South side of the entrance to Terror Cove. Approaching Port Ross from the eastward, this reef should be carefully avoided. *Ocean Island* is three-quarters of a mile West of Ewing Island, and is connected by shoal water to the S.E. point of the harbour. *Rose Island*, which forms a continuation of the North side of the entrance, lies to the N.W. of Ocean Island; and from between these the harbour runs 2½ miles to the S.W., having a depth of 10 to 20 fathoms over it, and the shores bold-to.

Deas Head, about three-quarters of a mile S.W. of Rose Island, is an interesting feature, formed of basaltic columns 300 ft. high, which are highly magnetic.

Shoe Island, in the middle of the harbour, and three-quarters of a mile South, *true*, of Deas Head, is a bold and picturesque island; it is highly magnetic, and is bold-to.

Terror Cove is to the West of this, and is separated from *Erebus Cove* to the South of it by a projecting point of land. Sir James Ross's Observatory was in Terror Cove. In former charts this is called the *Harbour of Sarah's Bosom*, being thus named by Capt. Bristow, after his ship, when he came here on his second visit in 1807. In his brief account he states that "ships may lie safely landlocked all round. Here may be had plenty of fine water, wood in the greatest abundance, winged game, &c. The islands are annoyed by the most powerful gales in winter."

The result of the observations made by Sir James C. Ross at *Sarah Harbour*, or Terror Cove, gave for the observatory, lat. 50° 32′ 30″ S., long. 166° 12 34″ E.* High water, on full and change, at 12^h; the highest spring tides scarcely extended 3 ft. A remarkable oscillation of the tide, when near the time of high water, was observed; after rising to nearly its highest, the tide would fall 2 or 3 inches, and then rise again between 3 and 4 inches, so as to exceed its former height rather more than an inch. This irregular movement generally occupied rather more than an hour, of which the fall continued about 20 minutes, and the rise 50 minutes of the interval.

In October, 1865, numerous trees, such as the ash, oak, and pine, with seeds of the turnip, carrot, lettuce, parsnip, pumpkin, &c., were planted on the South side of Erebus Cove, by Capt. Norman. Four goats (three females and one male) were also landed. No traces of pigs were seen here, or northward of Chambres Inlet, as they appear to keep about the middle of the island, but a dog was seen.

The establishment of the Southern Whale Fishery Company was fixed at the South side of Erebus Cove, but nothing now remains but the ruins of the buildings. This cove is bounded on the South side by a small peninsula, projecting in an E.N.E. direction (*Pik Point* of Bristow), and connected by a narrow isthmus.

From this part the head of the harbour extends nearly 2 miles farther in a W.S.W. direction to its head, into which a fine and copious stream of fresh water falls. In its upper part Mr. Enderby found a large and valuable bed of cockles, little inferior to oysters. The depôt of provisions, stores, and ammunition, is situated close to the watering place in Erebus Cove; it is a square wooden house, nearly white from exposure to the weather.

The *eastern* side of the island is but little known. From the chart by Admiral D'Urville, it has several most excellent harbours, a fact confirmed during subsequent visits. That one will be found superior to Laurie Harbour is not likely, but they may prove of great service. One of them was named *Chapel Bay*, from a rock, the form of which gave the appellation, near its entrance. *Musgrave Inlet* runs in westward and W.S.W. about 5 miles, and there is anchorage about 2 miles within, or at the head. *Smith Harbour*, to the North, forms a good harbour for a steamer or a small vessel.

Adams Island, the southernmost of the Auckland group, rises about 2,000 ft. above the sea, and faces the South end of Auckland or the main island, forming between a channel the whole breadth of the islands called Adams Strait, or Carnley Harbour.

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* The position would be thought to be beyond the means of an ordinary merchant vessel to correct, yet in 1868 it was announced that the ship *General Grant* was wrecked on them, because they were 24 miles from the correct position on the *charts*—a vague assertion, for which there is not the shadow of an excuse.

Carnley Harbour.—The western entrance to Carnley Harbour is very narrow, and only fit for small steamers; there is a large whirlpool in the narrowest part. Soundings vary from 13 to 3½ fathoms. The depôt in this harbour is situated in a ruined house at Epigwaitt, on the East side of South Arm, and a notice to that effect has been placed on Flagstaff Point. There is a good anchorage in 11 fathoms, inside Flagstaff Point; the anchorage may be recognised by a sandy beach, and being close to the depôt is convenient for landing stores.

The eastern entrance to Carnley Harbour is about 5 miles to the N.E. of the South Cape, and is formed by two bluff points, from which to the head of the lagoon the distance is about 10 miles. The passage is above 2 miles wide, and entirely free from danger within 25 fathoms of each shore. It runs in first N.N.W., then N.N.E., forming at the head of the lagoon a beautiful basin, with sufficient room for half-a-dozen ships to moor; the least water from the entrance until we came near the anchorage was 25 fathoms mid-channel; we anchored in 4 fathoms, clay ground.

"*The western side* of this island is a perpendicular bluff iron-bound coast, with deep water within 100 fathoms of the shore, while the eastern coast is principally lined with a pebbly or sandy beach, behind which are extensive level plains, covered with beautiful grass and refreshing verdure, extending back about 5 miles, and then rising into elevated hills."

The western side of the island, according to Captain Bristow, is very high, precipitous, and may be seen, in clear weather, 48 or 50 miles off. Towards the northern part are two remarkable natural pyramids or columns, called the *Column Rocks*.

The N.W. cape is a very remarkable headland, with a rocky islet and a curious conical rock just off it; just to the eastward of it is a dark-looking promontory, called *Black Head*, with a deep cavernous indentation at its base; this was afterwards found to be only a short distance from the westernmost part of Laurie Harbour. It was reached by Mr. McCormick and some other officers, by following the stream which empties itself into the head of the harbour, and whose source is in the hills above Black Head; these hills are from 800 to 900 ft. high.

Disappointment Island lies about 2 miles off the western side of the island, and is shown on Bristow's chart. It is small in extent, high, rocky, and inaccessible.

Bristow Rock, which must be very dangerous, is shown on Bristow's chart as lying 1 mile North of Enderby Island, just even with the water's edge, H.M.S. *Cossack*, 1873, saw it break, and placed its position as 2¾ miles from the North extreme of Enderby Island. This rock does not always break, and requires great caution. The tide rips extend a long way off, sometimes to 12 miles N.E. of the North point of Enderby Island. The flood sets N.N.E and the ebb to the southward.

Breakers were seen by H.M.S. *Emerald*, 1879, when passing *Blanche Rock*, both in the vicinity of that danger and to the southward of it.

This will close our remarks on this important group. The charts will furnish all additional information.

ANTIPODES ISLANDS.

This small and isolated group is but an imperfect representative in the South, of London in the North hemisphere; from its geographical position the name was given to it, in 1800, by Capt. Waterhouse (?); but as it does not occupy the precise spot that this name would indicate, it has sometimes been called *Pen*antipodes Island. Its position given was latitude 49° 32′ S., and its longitude, according to Lieut. O. H. Wilson, R.N., is 178° 42′ E.; but, according to Krusenstern, it is in 179° 40′ E., possibly a misprint, which was followed by Lieut. Raper and others.*

But in 1846, Capt. B. Darley passed them on April 27, and by the means of two chronometers, and several good lunars, he confirmed Lieut. Wilson's longitude, viz., 178° 40′ E., and the latitude found was 49° 40′ S.

They were visited by Captain W. H. Norman, in the steamer *Victoria*, in November, 1865, on a fruitless search for shipwrecked people. He describes it as having perpendicular cliffs all round, rising to heights varying from 200 to 600 ft. On the N.W. cape is an immense cave, about 120 ft. high; there are also several small islets from 150 to 200 ft. high on the North, N.E., and East sides; none of them are more than a mile off the main island, and all of them appear safe to approach or to pass between. The highest part of the largest island is apparently about 1,100 ft. high. No landing-place was seen, unless on the E.N.E. corner, where some rocks jut out a few yards, but when passed the sea was running too high to make the attempt. The only vegetation seen on this island was some long grass and fern or scrub of a dark colour, on the top and sides of the hills.

Capt. W. Parfitt, who passed it in the *Holmesdale*, August 24, 1865, made the lat. *about* 49° 55′ S., long. 178° 55′ E. He says that there is a remarkable high and large pillar-shaped rock off the West end.

Captain Norman's position, lat. 49° 42′ S., long. 178° 43′ E., agrees very well with those above quoted, but the particular point is not named on either.

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* See Nautical Magazine, March, 1840, p. 145. Lieut. Wilson, who has given a view of the island, says that in running on a parallel between lat. 49° 50′ S. and 53° 0′ S., from the longitude of 172° 0′ E. to 162° 0′ W., they observed tangles or trumpet weed daily floating past.

BOUNTY ISLANDS.

This little group derives its name from a well-known vessel of the Pacific, that commanded by Capt. William Bligh, in 1788. They were seen on his passage to Tahiti, and he thus records their discovery:—"On the 19th of September, 1788, we discovered a cluster of small rocky islands, bearing E. by N. 4 leagues distance from us. We had seen no birds or anything to indicate the nearness of land, except patches of rock-weed, for which the vicinity of New Zealand sufficiently accounted. The wind being at N.E. prevented our near approach to these isles, so that we were not less than 3 leagues in passing to the southward of them. The weather was too thick to see distinctly; their extent was only 3½ miles from East to West, and about half a league from North to South. I could not observe any verdure on them; there were white spots like patches of snow, but they may be of white stone or marble. The westernmost of these islands is the largest; they are of sufficient height to be seen at the distance of 7 leagues from a ship's deck. When the easternmost bore North, I tried for soundings, being then 10 miles distant from the nearest of them, and found bottom at 75 fathoms, a fine white sand; and again at noon, having run 6 leagues more to the E.S.E., we had soundings in 104 fathoms, a fine brimstone-coloured sand."

Bounty Islands were visited by the *Victoria* in November, 1865. Captain Norman says that there are some outlying sunken rocks, very dangerous to approach, about 3½ miles off the W.N.W. side, and the sea was breaking over them with great fury.

Lieut. B. J. Jackson, of H.M.S. *Rosario*, 1870, counted twenty islands in all, but half of them were not more than 10 or 15 ft. out of water; the largest, which is the westernmost but one, covers from 8 to 10 acres. The group might be divided into two clusters, with a passage between them; there is a rock nearly in the centre, over which the sea breaking and the spray thrown up, presented a grand appearance; there is also a blow-hole in one of the western cluster which throws clouds of spray some 300 ft. high. The sea was seen breaking from 3 to 4 miles to the westward, probably over the sunken rock reported by Commander Norman.

There is also a *sunken rock*, to the southward of the group, bearing from the western extreme of the group S. ½ W., and from the eastern extreme S.W. ½ S., distant 3½ miles, or about 2¾ miles off shore. These rocks are exceedingly dangerous, and great care should be taken in approaching the islands in thick weather, as they sometimes do not break for 5 or 10 minutes. The eastern islet, which is one of the highest, is 280 feet high. Lat. 47° 46′ S., long. 178° 56′ 44″ E.

CHATHAM ISLANDS.

This group was discovered by Captain Broughton, attached to Vancouver's expedition, in the armed tender *Chatham*, from whence the usual name is derived, on November 27, 1791.

Captain Broughton afterwards landed, and took formal possession of the islands, in the name of His Britannic Majesty. The people were like those of New Zealand. From the period of their discovery they had not been settled or visited, except by the whalers, who came hither to refit, or follow the shore fishery, until 1840, when the purchases of land in New Zealand by the British Company having suddenly ceased, in consequence of a proclamation, a vessel, the *Cuba*, was despatched hither by that Company with Mr. Hanson as agent, and Dr. Dieffenbach as naturalist, to purchase the territory of the native chiefs. This, it was stated, was done; and it was resold to a Hamburg merchant for a large advance on the cost, but nothing was done to colonize them.

The present population is as varied and motley an assemblage of people as can well be imagined. There are Marioris (natives), Maories, Kanakas, Negroes, Chinese, Spaniards, Portuguese, Danes, Germans, English, Irish, Scotch, Welsh, &c.* In 1874, there were about 150 white inhabitants, chiefly English and Germans, engaged in sheep farming. In 1881 the inhabitants numbered 242.

"The natives of these islands were found by Capt. Broughton to be a cheerful race, full of mirth and laughter, dressed in seal-skins or mats, and courageous enough to resist his landing. The sealers who first visited the island—and I had met with some who had been there ten years ago—found the natives numerous and healthy, in number at least 1,200, and they were received by them with a hearty welcome. What a wretched change has taken place in the short interval which has since elapsed!—a change occasioned by the importation of about 800 New Zealanders, brought thither by a European ship in 1830 or 1831. Not 90 of the original natives now survive in the whole group."—*Dr. Dieffenbach*, 1840.

We have no very recent estimate of the number of survivors of these ill-fated people: but their conquerors, with the jealousy and rivalry peculiar to the New Zealanders, were in almost continual warfare with each other, and a portion of them emigrated to the Auckland Islands, and were found there by Mr. Enderby at the commencement of 1850.

In 1868 these islands were surveyed by Mr. S. P. Smith, of the New Zealand Survey Department; a reduced copy of the chart will be found in the Nautical Magazine, November, 1878. The ensuing chiefly consists of extracts from Dr. Dieffenbach's account, with which our later information is incorporated.

* See a paper in the "Anthropological Review," 1870, p. xcvii, on the Chatham Islands.

The whole group consists of three islands, and several islets; the largest one, called *Ware-kauri* by the natives, and *Chatham Island* by its first discoverer; a smaller one, named *Rangi-haute*, or *Pitt Island*; and a third, called *Rangatiri*, or *South-east Island*. In some charts an island is laid down, called Cornwallis Island, but I have been repeatedly assured that no such island exists; and that a rock, called, from its shape, "The Pyramid," must have been mistaken for it. There are also, to the N.W., Rangitutahi, or the Two Sisters; to the East, the Forty-fourth Degree Isles: and some reefs, which will be described hereafter. The rocks are generally marked by kelp.

WARE-KAURI has nearly the form of a horse-shoe, or rather that of an indented square, the four sides of which are directed towards the four points of the compass. The North coast is 31 miles in extent E.N.E. and W.S.W., while its southern part is not above 15½ miles in width, the intervening space being only about 5 miles in width in its narrowest part. On its West side, where ships coming from New Zealand will generally first make the land, it stretches in a semicircle from S.W. to N.W., so as to form a deep bight, named Petre Bay.

Petre Bay.—The land has here an undulating surface of small elevation, and is overreached to the North and N.W. by higher detached hills, which have either regular pyramidal forms, or are irregular and massive in shape. With the exception of two hillocks at the S.W. point of the island, which the natives name *Wakkaaiwa*, no hills are visible in that direction; but the land rises gradually from the shore, which is rocky, and clothed with verdure to the water's edge, and at the top of the slope spreads out into a level or undulating surface. On advancing towards the inner part of the bight, a red cliff, or rather bluff, becomes visible, which forms the northern headland of a smaller bay or inlet within the larger bight, the southern head of which is a bluff of the same description. The distance between these two bluffs is 3 miles; the beach between them is sandy, and bordered by low hills. This inlet has a very regular semicircular form; and under the southern bluff is the principal harbour, called *Waitangi*. From the northern bluff the beach becomes again sandy for some miles, and afterwards rocky, which it continues to be to the N.W. point of the island, being indented by four small bays, three of which are close together, the fourth being near to the N.W. point. These bays are open to the S.E. by E., and two of them, though small, are good harbours.

The northern side of the island forms several wide, open bays; to the westward the shore is flat, and the headlands of the bays run out in long, wooded tongues of land. About 5 or 6 miles from the N.W. point there is a group of irregular hills, which terminates in a rocky precipice towards the sea, from the foot of which runs out a spit with a level beach, Cape Pattisson. These hills are called *Maunga-nui* (the high mountain), although they are of very inconsiderable elevation.* In the middle of the bight, between this cape and a

* On making the Great Chatham Island from the westward, Mount Maunganui is very

yellow bluff, named Cape Young, 8 miles to the eastward, four needle-shaped rocks lie about a cable off the shore; the beach itself consists of a fine sand. On the other side of the latter headland the shore retreats again, and runs for about 18 miles to the eastward, with a broad beach and low wooded hills. Although the beach is sandy, rocks spread along the shore are left uncovered by the sea at low water; this beach is terminated by a long point, behind which, about 2½ miles from the East end of the island, there is a small bay, *Kaïnga-roa*, with an entrance partly obstructed by rocks. *Point Manning*, the N.E. end of the island, is extremely rocky; and its outermost point is formed by an island, or rather a peninsula, called *Wakuru*, as the channel which separates it from the main island is dry at low water. An extensive range of reefs and rocks extends about 2 miles to the eastward of it.

The coast continues to be rocky on the East side of the island, which is about 24 miles in extent, first forming a bay about 2 miles long, enclosed by a broad sandy beach and low wooded hills. Rocks, most of them only visible at low water, are everywhere scattered along the shore, and stretch off about a mile to seaward. The southern head of this beach is perfectly rocky, and from thence a long, deep bay, named *Hanson Bay*, extends to the S.E. point of the island. Sand-hills are thrown up along the coast, and stunted shrubs cover them on the weather side. The S.E. point, *Tupouranga* or *Cape Fournier*, is formed by a hilly promontory covered with wood. Rocks and shoal water extend 2 miles to the N.E. of it.

The southern shore is abrupt and precipitous, with but few dangers off it; the land on the summit of the cliffs is level, and covered with trees. Small streamlets trickle down the cliffs, and clothe their face with herbage. The S.W. point has a remarkable hill behind it, with a cleft rock on its summit, and is thence named *Cape l'Evêque*. At about 5 miles S.E. ¼ S. from Cape l'Evêque is a rock under water, called the *Sentry* (or *Solitaire* by Capt. Cecille), upon which the sea breaks violently, but it is all beneath the water.

None of the hills are much more than 800 ft. in height. The westernmost is called *Mata Ketaki*, or *Mount Patterson*. Two or three miles from it there is a small group of hills, separated from each other by ravines, called Maunga-nui. At 3 miles distant from Maunga-nui, near the head of Wangaroa Bay, there is another hill of small elevation, called *Emo-kawa;* 3 miles from which, near the head of Wanga-tehe Bay, is *Maunga-wakai-pai*, the most regular pyramid, and apparently the highest of all. Only a few miles to the N.N.E. of it is *Waipapa*, likewise pyramidal. The last in the series, and that from which the original

conspicuous, being a high rugged hill, with a broken irregular outline, appearing to form the North extreme of land; but, on approaching nearer, Patterson Point, a long low projection, off which there are dangerous reefs extending a mile or more, will be recognised. Mount Dieffenbach will be seen to the right of Maunganui, which is a sharp-pointed pyramidal hill, said to be the highest on the island, but Maunganui looks higher. There are other peaks resembling Dieffenbach, but much lower.—Captain C. W. Hope, R.N., H.M.S. *Brisk*.

name of the island is derived, is *Ware Kauri*, about 2 miles from the northern shore, and 15 miles from the West end of the island. It consists of several deep declivities, and is wooded; but it is not higher than the others, and is apparently of the same structure. The only other hills on the island, Maunga-nui and Mount Dieffenbach, have been before mentioned, but there are two hillocks at its S.W. end, called Waka-kaiwa, which are an excellent seamark. Captain Cecille, of the French Marine, calls the S.W. point *Cape Evêque* (Point Beaufort), from this hill resembling a bishop's mitre.

Geologically speaking, the Island of Ware-kauri belongs to New Zealand; and this is still further confirmed by its plants and animals. The whalers say that soundings can be obtained between New Zealand and Chatham Islands, a remarkable phenomenon, if correct.

The surface in the northern half of the island is generally undulating, deep, and boggy, and promises to be highly productive, being equally fit for grain or pasturage. Wherever the superfluous water has been carried off by a natural outlet, a rich vegetation of fern and New Zealand flax (*phormium tenax*) has sprung up, giving additional firmness to the soil by decayed leaves, and yielding a rich harvest to the native planter. This is particularly the case on the low hills above the sea-shore, which are well wooded, and encircle the island with a verdant zone. Where these hills are sandy, the decayed leaves cast by the trees have formed a light, black soil, which the natives prefer for agriculture. The conical hills, which rest on a volcanic rock, have a very rich soil in their neighbourhood, which is generally covered with a vegetation of fern and trees, agreeably mixed together; and these fertile spots are like so many oases rising from the surrounding bog. On the West side of Wanga-roa Bay, and at other places between Maunganui and Emo-kawa, the soil has been set on fire by some cause or other, and is burning slowly beneath the surface; the temperature also is raised, although neither flames nor fire are visible. The northern part of the island presents a remarkable feature, viz., several lakes, usually surrounded by gently-sloping hills. They are most frequent near the northern coast, and are usually 1 or 2 miles in circumference. There are some also not far from the beach near the western coast, the largest of which is at the head of Waitangi Bay, and about 6 miles in circumference. A river, named *Te Manga-pe*, from 6 to 8 yards broad, drains this lake, and is tributary to another river, which enters Waitangi Harbour.

This lake is separated by a range of low fertile hills from *Te Wanga*, the largest lake in the island, which is, however, brackish. It is about 15 miles long, and 2 to 4½ miles wide, and therefore occupies a very large portion of the whole island. It is nearly surrounded by hills either wooded or boggy, but on its eastern side it is separated from the sea by low sand-hills, about 100 yards broad. In 1837 this barrier was broken through; in 1840 it was entire; in 1841 a channel again formed which appeared to be, but was not, accessible for

boats. At first the lake diminished in size, but afterwards it increased, and partook of all the movements of the tide.

The larger and better part of the island is that to the southward of Waitangi Harbour; here it has an undulating surface, and is not so boggy as the rest. In general the soil is extremely fertile, and preferred by the natives to that of New Zealand. The climate is stated to be mild and agreeable; the prevailing winds are N.E. and S.W.

PETRE BAY.—Capt. Hope, H.M.S. *Brisk*, says that the only anchorages to be recommended in Petre Bay, are Wangaroa or Port Hutt, and Port Waïtangi, the other bays on the North side being exposed to South and S.W. winds. On steaming along the northern shore of Petre Bay nothing was seen of Heaphy Shoal, and it was stated that it had no existence. There was a heavy swell running, but no appearance of a break anywhere off this shore, except upon Jenny Reef, which appears to be rather less in extent than the chart shows.

PORT WAITANGI, the principal place in the Chatham Islands, in in lat. 43° 56½′ S., long. 176° 30′ W. The resident magistrate lives here, as also several other Europeans. Fresh meat, poultry, and vegetables may be obtained in abundance and very cheap; the potatoes, for which these islands are celebrated, are very fine, and at times a large quantity is exported to New Zealand and Australia. The land in the neighbourhood is excellent; wheat is cultivated, and answers well, and all kinds of English fruits and vegetables come to perfection. The lakes abound with wild ducks, and there are also curlew, plover, and pigeons, with abundance of wild pigs all over the island.—*Capt. Hope, R.N.*, 1865.

Though exposed to the N.W. winds, the force of the swell is broken by the N.W. end of the island, and also by a short reef, which runs off from the southern bluff, and may be doubled by *ships* of any size to half a cable's length. From the south-westerly winds which prevail during a great part of the year, this harbour is completely sheltered. Its general depth of water is from 7 to 12 fathoms, and the best anchorage is in 5 fathoms, off the southern bluff, where the bottom is a firm sand. If a ship anchors further to the northward, she is more exposed to the swell occasioned by long north-westerly gales; and the danger increases if she anchors too near the shore.

The tide in this place comes from the southward, but is very irregular, generally recurring only once in twenty-four hours; and at changes it rises to about 6 ft. If easterly and southerly winds have long prevailed, the tide cannot be perceived at all, and its force is hardly ever perceptible at any time.

Captain Hope says:—The anchorage at Port Waïtangi is not a safe one for large vessels during westerly gales. Vessels drawing not more than 12 or 13 ft. may ride out S.W. gales by anchoring close in with Hanson Point bearing S.W. or S.W. by W.; they will then be in a measure sheltered from the heavy sea, but will experience a rolling swell that will try their cables.

With a gale from N.W. this is decidedly a dangerous anchorage. The *Brisk* experienced a heavy S.W. gale while at anchor here in May, 1865, with Clatchie Point bearing W.S.W., in 6 fathoms, fine black sand, and was in a very critical position. A shoal, having 5 fathoms on it, is said to lie 1½ mile to the northward of the anchorage, but the exact spot is uncertain. It is, however, known to the natives, who go there to fish.

A signal staff has been erected on the hill above Point Hanson, the shoal water off which is marked by kelp. Landing on the beach is not good.—*Nav.-Lieut. J. Stocker*, H.M.S. *Emerald*, 1879.

PORT WANGAROA, the only good harbour in the islands, is northward of Waitangi; the holding ground is rocky and tolerably good. This bay is an oval, nearly a mile deep, its extreme points being half a mile distant from each other. The best anchorage is about two-thirds up the bay, somewhat nearer to the western than to the eastern shore, in 6 fathoms water, with a soft sandy bottom. The anchorage is protected from N.W. winds by the land, and from S.W. winds by the lee of the western side of the harbour. The tides here are also irregular.

Captain Hope says:—Port Wangaroa is sheltered from all winds, but it is very confined, and as with strong West and S.W. winds there is a heavy sea at the entrance, a vessel should anchor as far in as possible. With the nib or hummock on Mount Iwa Kawa open to the eastward of Maunganui, the harbour is open, and the white sandy beach at its head will be seen. There are likewise sandy beaches at the head of the two bays to the eastward of Wangaroa, therefore care must be taken not to mistake between them.

The sea breaking on the rocks on either side of the entrance to Wangaroa marks the dangers, and it is only necessary to keep midway between them, and steer straight in on a N.W. by W. course. A patch of floating kelp stretches partly across the entrance from Napper Reef, but there is deep water where it lies, and the *Brisk* passed through it. The reef off Gordon Point must be avoided, but the outer edge of the kelp there marks the deep water.

H.M.S. *Brisk* anchored inside the line from Gordon Point to Evans Point in 5 fathoms, coarse sand and shells, with the centre of the little cove behind Evans Point bearing N.E. There is a stream of excellent water at the N.W. corner of the harbour.

The United States' Government Expedition for observing the transit of Venus in 1874, was established on the shores of Wangaroa Harbour, the longitude of which was found to be 176° 39′ 49. 5″ W. Fresh water and wood can easily be obtained; also mutton and beef from the settlers, but vegetables are scarce. It is high water, on full and change, at about 5^h; the rise is 2½ ft.

The two harbours to the eastward of Wangaroa, called *Wanga-moe* and *Wanga-tehe*, are nearly similar to Wangaroa, and perhaps offer the same advantages; but there is nothing particular to recommend them.

Pohaute or Ocean Bay, 2½ miles to the westward of Wangaroa, has nearly

the same shape, but is more sheltered. The land around it is also richer and more cultivated. It was formerly the principal resort of vessels in quest of seals; and, as a large French whaler, the *Jean Bart*, was captured there by the natives, it evidently has a good anchorage.

At 4 miles westward of Ocean Bay is *Maruwaka* or *Point Somes*, some reefs stretching off the coast between them. To the S.W. of Point Somes is the extensive *Western Reef*, the position and extent of which are uncertain; it consists of a range of rocks and a long reef uncovered in some parts, extending to about 8 miles from Point Somes, and was once a favourite resort of seals. The channel between it and the point is about $2\frac{1}{2}$ miles wide; the *Cuba* passed through it and found it clear.

The northern shore of the island is much exposed, and could only serve as a roadstead. It has, however, one sheltered bay, $2\frac{1}{2}$ miles from the north-eastern extremity; its name is *Kaingaroa*. The eastern and western extremities of this bay are rocky promontories, two-thirds of a mile apart, each terminated by a spit of reefs, over which breakers are continually seen. The outermost rock off the eastern point is below the surface, but occasionally covered with breakers. The rocks above water, off the western point, extend to the middle of the entrance of the bay, and are also terminated by a sunken rock, 500 yards distant, the navigable channel being thus very narrow. A ship can enter with a northerly wind between the two sunken rocks, and would be sheltered from all winds by the western point,where there seems to be the best anchorage.

About 11 miles N.W. by W. $\frac{1}{2}$ W. from Cape Young, on the North coast, are *Rangi-tutahi*, or the *Sisters*, two flat-topped pyramidal rocks, about 100 ft. high, covered with scanty bushes, and frequented by countless numbers of sea-birds. They are surrounded by reefs, and a long line of breakers is said to stretch 5 miles N.W. by W. from them, *N.W. Reef* being at the outer end; it is reported, on tolerably good authority, to lie 4 miles W. by N. $\frac{3}{4}$ N. from the Sisters. These rocks were formerly much frequented by sealers.

The best anchorages on the eastern shore are about 6 miles from the N.E. extremity, where a boat can land at all times, and at *Oinga*, where the hilly foreland offers some protection. But easterly winds often set in suddenly.

PITT ISLAND, or Rangi-haute, and its surrounding islets and rocks, have been most incorrectly laid down on the chart, according to the description by Captain Hope, R.N., and the survey by Mr. Smith; in fact, with the exception of Sentry Reef, the entire chart South of Capes Evêque and Fournièr was erroneous. The North end of Pitt Island was placed 5 miles too much to the northward, and the shape and outline of its shores are altogether different. It is separated from Ware-kauri by Pitt Strait, 11 miles wide, and is 8 miles long, N. by W. and S. by E., varying in breadth from $1\frac{1}{2}$ to 4 miles.

The North end of the island forms a bay about $1\frac{1}{2}$ mile wide and half a mile deep, where there is good anchorage with all southerly winds. From the

centre of this bay Evêque Point bore W. ¾ N., and Cape Fournièr N.W. by N. Mr. Hunt, an Englishman, who had resided for 25 years on the island, lives in this bay; he farms a great portion of the island, and gains his livelihood by supplying whalers with fresh provisions of all sorts. He also acts as pilot to them, and it is chiefly from him that Captain Hope derived whatever information did not come under his own notice.

On the East side of Pitt Island there is an anchorage much frequented by whalers, where vessels may ride well sheltered from westerly gales; and on the West side there is good anchorage with northerly and easterly winds in *Waihere Bay*, behind a precipitous island, called *Mangere*, 300 to 400 ft. high. Close to the S.W. end of Mangere is a rock called the *Fort*, and at 1 and 1½ mile farther to the S.W. are two other rocks, the inner one called the *Castle*, a remarkable sharp-pointed serrated rock; the extreme rock of this very remarkable group, called *Sail Rock*, from its extraordinary resemblance to a boat with a gigantic lug sail, lies about 4 miles W.S.W. of Mangere.

Reefs awash extend about 1½ mile off the South point of Pitt Island, and to the eastward are four or five isolated and conspicuous rocks, the outermost of which is *Round Rock*, in appearance like a bell, at about 3½ miles S.W. by W. ½ W. from the point. At 1½ mile from the easternmost point of Pitt Island, is *N.E. Reef*.

Supplies.—Abundance of fresh meat, potatoes, and vegetables may be obtained at Pitt Island, as also poultry, milk and butter. It is thickly wooded, the soil very fertile, and all kinds of European fruits, &c., grow and thrive. Wheat is also cultivated, but not in quantity sufficient for exportation.

About a mile off the S.E. end of Pitt Island is *Rangatira* or the *S.E. Island*, 678 ft. high, a rock lying in the passage between them. A low rock, named *Fancy*, lies about 1⅔ mile to the S.E. of Rangatira, and about 3½ miles to the eastward of the island *William Hamilton Reef* has been reported. About 4½ miles to the S.S.E. of Pitt Island is *Tarakoikoia*, or the *Pyramid*, an islet 566 ft. high, the southernmost of the Chatham Islands.

About 13 miles E. by N. ½ N. of Rangatira, is *Ahuru* or *Eastern Reef*, consisting of several small rocks, surrounded by a reef about 1½ mile in extent. At 6½ miles N.E. ½ E. from the N.E. point of Pitt Island, is *Motuhope*, an islet with some rocks, surrounded by an extensive reef, also known as *Star Quay Reef*. Dr. Dieffenbach saw these rocks, and says that they were marked by high breakers.

At about 22 miles N.E. by E. ½ E. from the S.E. point of Chatham Island are *Bertier Rocks*, or the *Forty-fours*, from lying nearly on the parallel of 44° S. These are one large and four small rocks, lying in a straight line East and West. The largest is a flat-topped islet, about 150 ft. high

CHAPTER IX.

NEW ZEALAND.

This very important country, one of the greatest interest in the southern hemisphere, was not correctly known to Europe until very recent times. Its first and imperfect exploration is due to Tasman. On December 13th, 1642, at noon, he saw a great and high land at 15 miles to the S.S.E. On the 14th, at noon, he was within 2 miles of it, in 55 fathoms, grey sand. He could not see the summits of the mountains, as they were hidden by the clouds. He sailed along the coast for several days, and on the 19th anchored in a bay, probably somewhere on the South side of Cook's Strait. The natives put off, and approached the *Zeehaan*, his vessel, and on sending off his boat, it was instantly attacked, and four of the crew killed. He then left this bay without landing, and named it *Moordenaar's* (Murderer's) *Bay*. He continued on the coast until the 6th of January, 1643, proceeding to the northward, and attempted to procure water from a small island, but was prevented by the hostile appearance of the natives on it, and the violent surf. He named it *Drie Koningen Eyland* (Three Kings' Island), because it was the feast of the Epiphany. He then sailed for the Friendly Islands.

The great imperfection of geographical knowledge, mixed up as this was with the fabulous, led Tasman to the belief that he had discovered a portion of the *Terra Australis Incognita*; and with this idea he considered that it might be connected with Staten Land, to the East of Tierra del Fuego, then recently discovered by Schouten and Le Maire, and accordingly named this *Staten Land*, in honour of the States General of Holland. But, soon afterwards, this continuity being disproved, its present name of *New Zealand*, after the Dutch province, was applied.

It was not until our immortal Cook returned from his first voyage in 1769, that we were made acquainted with the true character of the group. In this, and in his two subsequent voyages, he completely examined their shores, and passing through the channel now bearing his name, established their insular nature. Although Cook's surveys and remarks, in many instances, do not approach to the accuracy and amount of detail required by the present times, yet they are still very interesting to the mariner.

The other early navigators, who have transmitted accounts of their visits to New Zealand, are Capt. Surville, of the French ship *Le St. Jean Baptiste*,

in December, 1769, that is, at the same time as Cook; then the unfortunate Capt. Marion came here to refit in March, 1772, but was killed and eaten by the savages in the Bay of Islands, June 12th, 1772.

As early as 1793 its harbours began to be frequented by whaling ships, but the intercourse reflects little credit on humanity. To remove this reproach, the Rev. Samuel Marsden, colonial chaplain of New South Wales, in 1814, established a church mission in the Bay of Islands, under the protection of New South Wales. In 1839 the New Zealand Land Company was formed, unsupported by the government, and consequently purchased the sovereignty of the land of the native chiefs. The first detachment of emigrants arrived at Port Nicholson about the end of January, 1840. The government had taken means, by following up Cook's claim of sovereignty for the British, by sending Capt. Hobson to the Bay of Islands as consul and lieutenant-governor. He established the seat of government, first at Russell in the Bay of Islands. This was but just in time, as *four days* later a French expedition arrived to take possession of Banks Peninsula as a penal settlement.

Thus New Zealand dates, as a British colony, from May, 1840, as a dependancy of New South Wales. In May, 1841, it was proclaimed a separate colony, under an independent government, the seat of that government being at Auckland.

The New Zealand Company received a royal charter February 12th, 1841. The affairs of the company did not flourish, and, from various causes, their efficiency diminished, and, according to an agreement with the government, they abandoned their projects in April, 1850. Such are the particulars of the first colonization of New Zealand. Since that period the chief colonizing operations have been the establishment of Canterbury, in 1850, on Banks's Peninsula, by a Church of England Association, and that of Otago by the Free Church of Scotland, in 1847. It was erected into a British colonial bishopric in 1841. The metropolitan see is Auckland, and in addition to this there are the four sees of Christchurch, Nelson, Wellington, and Waiapu.

The islands of New Zealand, as is well known, consist of three principal ones; the two northern of which are separated by a strait (Cook's Strait), varying from 12 to 100 miles in breadth. The general trend of the land forms an extensive curve facing the W.N.W., and are together about 930 miles in length, extending over more than 13° of latitude.

The names by which the islands have been distinguished are involved in some doubt. Cook says, with some uncertainty, that the prineipal were *Tovey-Poennammoo* and *Eahi-No-Mauwe*. This was afterwards found to be correct, as far as the country on either side of Cook's Strait is concerned. But it is considered that there is some error in the transcription of Cook's manuscript as regards the latter name, which, according to Mr. Kendal, should be *Ika-Na-Mawi*, the name of the South island being more properly *Kai-Mohoura* (lobster-eaters).

The natives of New Zealand have been so often described, that it is needless to repeat much here. Their ferocity and cannibalism distinguished them, but their many redeeming qualities place them high in the scale of human nature, as is evidenced by the great change which has taken place in their general character since they have become Christianized. It is much to be regretted that their interests not having been sufficiently studied, it should have led to outbreaks and warfare, which have periodically desolated some of the settled regions. The total number of natives, from a close estimate by Mr. E. Halswell, in 1841, amounted to 107,265. According to a government estimate in 1857, it was only 56,049. By the census of December 19th, 1867, they had decreased to 38,540, and the census of 1872 gave the number as 36,359, so that they were disappearing very rapidly, but at the census of April 3rd, 1881, they numbered 44,099. They have been almost extirpated in Middle Island, from a cruel native warfare, before the times of the British occupation, and now number about 2,500. The most thickly peopled parts are North of Poverty Bay, around Whangaroa, and the Bay of Islands.

New Zealand is pre-eminently a volcanic country. In North Island are seen active volcanoes of great height, and some very singular localities and phenomena existing in its centre. No active volcano is said to exist in South Island, but the chain of lofty peaked mountains on the western side, rising above the limits of perpetual snow, are of the same character. Earthquakes are of very common occurrence in the vicinity of Cook's Strait, and their frequency and intensity do not appear to have been sufficiently noticed in the early accounts of the colony.

In consequence of the great quantity of moisture the vegetation is remarkably vigorous. One of the productions most interesting to mariners is the famous *kauri pine*, or, as it has been called, cowdy, with its straight and even trunks sometimes rising to the height of 90 ft. before any branches shoot out, furnishing some of the most excellent masts in use. The kauri gum or resin was at first considered simply as a curiosity. It is found only in the province of Auckland, and in a fossil state. In 1852, 117 tons were exported, worth £865; in 1857, 2,521 tons were exported, worth £35,250. In 1881, 5,458 tons were exported, valued at £253,728.

The preparation of flax as an article of commerce is also a great industry. In 1867, the value exported was £4,256; in 1871, £90,611; but in 1880 only £15,617. In 1870, 161 mills were in operation for its preparation from the plant *Phormium tenax*, which was formerly in the way of the farmer, and is now in many places cultivated; in 1881 only 40 mills were at work, The principal items of export in 1880 were gold valued at £1,220,263; wool, £3,169,300; grain, flour, provisions, timber, &c., £1,454,303; kauri gum, £242,817; and flax, £15,617. The total value of the exports of New Zealand produce in 1872 amounted to £5,107,186; in 1881 it amounted to £6,060,866, and the value of the imports for this year amounted to £7,457,045. From

1857 to March 31, 1882, *gold* to the value of £38,562,025 was entered for duty on exportation from New Zealand, the districts of Otago and Nelson, in Middle Island, being by far the most productive.

Coal exists in many parts of the colony, notably in the districts of Otago, Southland, and Nelson in Middle Island, and Waikato, Drury, and the Bay of Islands, in North Island. Several companies are actively working the deposits. The Nelson coals of the Grey, Buller, and Massacre Bay, and those of the Malvern Hills in Canterbury, appear likely to be useful for steaming purposes. Bay of Islands coal is hereafter described. The total output for the year 1881 was 337,262 tons.

The railways, 1,333 miles of which were open for traffic in March, 1882, and nearly 1,200 miles more proposed, will be described with the description of each port from whence they start. At the same date there were 3,820 miles of telegraph line in use; a submarine cable connects it with Australia.

The population of the colony, the area of which is estimated at about 106,260 square miles, was by the census taken on April 3rd, 1881, 534,032; of these, 44,099 were natives, and about 5,000 Chinese. In 1843, the European population consisted of 7,264 males, and 5,924 females; in 1861, 61,062 males, and 37,958 females; and in 1881, 269,605 males, and 220,328 females.

The coasts had been partially surveyed by various officers, among whom may be enumerated D'Urville and the officers of the New Zealand Company; but these incomplete and unconnected representations have been quite superseded by the later and complete charts of our Admiralty.

The islands were surveyed by Captains J. Lort Stokes and Byron Drury, R.N., in H.M.S.S. *Acheron* and *Pandora*, and from the information derived in the surveys, between 1848—1855, as furnished chiefly by Captains G. H. Richards, R.N., and Fred. J. Evans, R.N., we have derived much of the following descriptions. It is manifest that a full account of the coast-lines of the islands, more than 3,000 miles in extent, and exceeding that of Great Britain, could not be compressed into a single chapter. It would require a whole volume to fully describe it. For this work it has not been thought necessary to go into the minute details which the "New Zealand Pilot" gives, and which, if required, must be sought for in the work itself.

Before entering upon a detailed description, it may be premised that the three principal islands were, at the time of the proclamation of the British government over the group, directed to be called *New Ulster* or *North Island; New Munster*, or *Middle Island;* and *New Leinster*, or *Stewart*, or *South Island*. The first appellations in this proclamation have not come into very general use, neither have the native names.

GENERAL SIGNALS FOR ALL NEW ZEALAND PORTS (1868).

Tide Signals.

Flood tide.—Two balls vertical at mast-head, not less than 6 ft. apart.

Last quarter flood.—Three balls vertical at mast-head, with not less than 6 ft. between each.

Ebb tide. —One ball at mast-head

Bar or Danger Signals.

Bar signals will be distinguished by their being arranged *horizontally.*

Wait for high water.—A ball at each yard arm, and one on mast half the length of the yard below the yard.

Stand on, take the bar.—Four balls horizontal on the yard, two on each side the mast.

Bar dangerous.—Three balls horizontal on yard, two on any one side of mast, and one on the other.

Put to sea.—Two balls horizontal on yard, on either side the mast.

Note.—Semaphore arms are to be used for piloting vessels over all bars where a pilot establishment is maintained, when pilots are not put on board, and the vessel being piloted is to be steered in the direction towards which the semaphore arm is pointed. When the semaphore arm is dropped, the vessel is to be kept steady as she goes.

Manukau Harbour having several channels, special regulations have been issued, for which refer to the description of that harbour.

Signals to be made from vessels entering or in harbour as required.

Exempt from pilotage.—White flag at the main.

Pilot required.—Union jack at the fore.

Steam-tug required.—Telegraph flag at the peak.

Mails on board.—Commercial telegraph flag at the main.

Health or boarding officer wanted.—No. 8 of commercial code at the main.

Gunpowder on board.—Ensign at the mizen.

Medical assistance wanted.—Union jack over ensign at the peak.

Custom boat wanted.—Union jack at the peak.

Clearing officer wanted.—White flag at the fore.

Police wanted (by day).—Ensign at the main.

Police wanted (by night).—Two white lights vertical at the peak, or at the same height where they can be best seen, 4 ft. apart.

In addition to the above, every pilot station is to be provided with a set of the commercial code of signal flags, which will be used as required.

Night Signals for Open Roadsteads, etc.

From Shore.

A boat will come off.—Two white lights, vertical (as to a steamer coming in).

Boat cannot put off.—Two lights vertical, upper *red*, lower white.

Wait till daylight, boat will put off then, weather permitting.—Two lights vertical, upper white, lower *red.*

Keep to sea, or put to sea.—Two white lights, horizontal, with a red light between them, to be used for vessels approaching or at anchor.

From Vessels.

Will wait till daylight.—Two lights vertical, upper white, lower *red.*

Cannot wait.—Two lights vertical, upper red, lower white.

Cannot keep to sea, or cannot put to sea.—Two white lights, horizontal, with a green light between them.

1. NORTH ISLAND.

North Island is 465 miles long, and of very irregular figure, its chief feature being the remarkable peninsula formed by the adjacent inlets at its North end. The coast-line is about 1,500 miles in length, and, for its length, its harbours are not numerous, and these are chiefly on the N.E. coast. All the harbours on the West coast have shifting sand-bars at their entrances.

It contains four of the nine provinces into which New Zealand is divided. Each of these provinces has a local government, consisting of a superintendent and a provincial council, subject to the governor appointed by the Crown, and the general assembly of two houses, the one elected by the people, the other appointed by the Crown.

Auckland occupies the northern part of the island, North of the parallel 39° S. Its chief town and the former seat of government is advantageously placed on an arm of Hauraki Gulf, on the East coast, and is also as closely approached by the harbour of Manukau on the West.

Taranaki lies on the westernmost promontory, surrounding the great volcano, Mount Egmont; though the smallest, it is considered to be the most fertile province of New Zealand. New Plymouth, its chief town, has only an open roadstead at present, but extensive harbour works are now in progress.

Hawke Bay abuts on the great bay of the same name on the S.E. coast, and is of great natural fertility. The chief town, *Napier*, has a small harbour.

Wellington Province embraces the southern portion of North Island. Its chief town, and seat of government of the whole colony, stands on the shore of the spacious and excellent harbour of Port Nicholson, and, from the advantage of its being the outlet of a very fertile district, it is the commercial depôt of a large extent of country.

In the following description we commence with the N.W. end, and proceed down the East coast southward; afterwards describing the West coast in the same order.

The THREE KINGS, or Manawa Tawi, 38 miles W.N.W. of Cape Maria Van Diemen, are the northernmost appurtenance to New Zealand. They were discovered and named by Abel Tasman, on January 6th, 1643, as previously noticed. Cape Morton Jones, the N.E. extreme, is in latitude 34° 6′ 20″ S., long. 172° 9′ 45″ E.

These islands have a barren aspect, of considerable height, the principal island being 995 ft., and may be seen on a clear day at the distance of 25 miles. They lie in an angular position, in a North, South, and East direction. The eastern island is the largest, and may be 1¾ mile in its greatest length; the other two are equal, both in size and height, and may be about a quarter of a mile long. At the S.E. end of the western island, adjoining, are several high rocks, which, at a distance of 7 or 8 miles, have the appearance of separate islets.

They are uninhabited, and landing is dangerous. There are good springs of fresh water, some goats, and abundance of wild celery. These islands do not occupy more space than 7½ miles E.N.E. and W.S.W. There is no danger to be apprehended at the distance of 2 miles on the South side, and the only danger is an uncovered *rock*, three-quarters of a mile East of the Great Island.

Admiral FizRoy says, while in sight of these islets, on New Year's day, 1836, he passed through several tide-races, one of which was rather heavy, and would have been impassable for a boat. These races moved toward the North, while they could trace their progress. The temperature of the water fell 6° after passing through the principal one. The next day it was found that the ships had been set much to the southward, so that it was inferred that they were regular tide streams rather than constant currents.

The northern extremity of the North Island of New Zealand consists of a peninsula united to the main island by a long sandy neck.

CAPE MARIA VAN DIEMEN is its N.W. point, and the direction of the North coast of the peninsula to Cape Otou, the N.E. point, is E. by N., distance 22 miles. The cape is steep, and 420 ft. in height. About half a mile to the N.W., but with no passage between, is a double islet, on which is the lighthouse, in lat. 34° 28′ 30″ S., long. 172° 38′ 40″ E. The cape is composed of detached rocks, of a hard conglomerate. Inland of this the land is sandy, and sand-hills run for a distance of about 4 miles along the coast to the eastward, when the shore again rises into cliffs. The sand, driven by strong westerly gales, which prevail here a great part of the year, has made great encroachments on the land, and, in fact, has nearly overwhelmed the whole of it. The sand-hills near the cape are separated by swampy valleys, from which streamlets descend into the sea.

LIGHTHOUSE.—On the islet off Cape Maria Van Diemen is a white wooden lighthouse, 20 ft. high, from which is shown a *revolving bright* light, attaining its greatest brilliancy once every minute, elevated 330 ft., and visible 24 miles in clear weather. From the lower part of the lighthouse a *fixed red* light is shown in a sector of about 30° towards Columbia Reef.

Pandora Bank, of 5 fathoms, hard sand, lies 6 miles S.W. by S. ½ S. from Cape Maria Van Diemen; it is steep-to on each side, and the sea usually breaks on it.

Cape Reinga, a spot held sacred by the natives, lies 4 miles N. by E. of Cape Maria Van Diemen; it forms one extremity of a cliff of conglomerate rock, which cannot be approached from the seaside, and which lines the coast for about 9 miles, and terminates to the eastward in a conical hill, *Te-wanga-ke*, whence the coast is lined by a sand-beach, to about the middle of the northern shore. It is here that the New Zealander believes there is a cave or passage through which the departed descend into the nether regions, placed at the limit (Te-muri-wenua, or land's end) of the world as known to them. The cliff above mentioned is the escarpment of a steep and narrow ridge of moderate

elevation, which runs inland towards the harbour of Parenga, presently described. Off Cape Reinga is the *Columbia Reef*, extending 2 miles to the westward, which constantly breaks. There is a small passage for coasters inside it. In former ages the kauri pine grew abundantly here, but it is now nearly extinct; the destruction of the forest has allowed the sand to encroach, and has sealed the doom of this portion of the island.

From Wanga-ke the North coast sweeps again in an open bay for some miles to the eastward. The eastern extremity of this bay is formed by a rocky peninsula, insulated at high water, which was formerly the stronghold of the Hapouri tribe. The highest of the hills, called *Hairoa*, is visible at some distance from the eastern coast, and an arm of the estuary of Parenga-renga extends to within 3 miles of its base. The whole of this place is called by the natives Kapo-wairua (a *spirit* which has become night, or is annihilated). The coast hence to North Cape is very rocky, alternating with small sandy bays. The general aspect of the coast here is that of steep cliffs undermined by the sea, and their summits terminating in a sort of even table-land. *Otahe Point*, the principal projection between the two capes, has a similar aspect. As must be evident, all the bays and anchorages on this part of the coast must be exposed to the North. The bay next to North Cape is known as *Tom Bowline Bay*.

CAPE OTOU, or NORTH CAPE, in lat. 34° 25′ 7″ S., long. 173° 4′ 30″ E., forms part of a peninsula of 5 or 6 miles in circumference. The promontory itself is 740 ft. high, and bold, presenting very steep sides to both the North and East coast; but a flat and swampy land of about 3 square miles in extent runs from the northern to the eastern coast, and separates this promontory from the hills at Kapo-wairua. The cape itself may be seen at 25 or 30 miles off. *Moudi-motou*, a small peaked islet, lies off the eastern part of North Cape, and is connected with it by a chain of rocks, even with the water; foul ground extends one-third of a mile N.E. by E. from the islet.

The eastern coast, from North Cape, runs South for the distance of about 6 miles, to the harbour of Parenga-renga. It is formed by perpendicular cliffs of volcanic conglomerate. In some parts it is a hard gray sandstone, in which Dr. Dieffenbach found a small layer of good coal.

PARENGA-RENGA does not appear upon any of the early charts, although it is an extensive inlet. The harbour, or estuary, as it should be more properly called, is from 6 to 8 square miles in extent, and sends several branches in different directions, for some distance inland, all which are navigable for boats at high water. The northern head, *Kohau*, or *Coal Point*, of Parenga-renga, is a black water-worn bluff, by which the entrance is easily distinguished, as the southern head, *Fox Point*, is a spit of dazzling snow-white sand, which stretches towards Mount Camel along the coast, and extends for some miles inland.

Parenga-renga is a bar harbour, and has a shoal sandy spit extending from

either entrance point; the northern spit runs from Coal Point south-easterly for 1 mile, with 9 ft. water on it; the southern spit extends from Fox Point in an E. by N. direction, and has less than 1 fathom. The channel lies between these spits, and is nearly a quarter of a mile in width, with 15 ft. at low water, which deepens to 5 fathoms as soon as the bar is passed. This bar generally breaks, and, until buoyed, the deep water will be best seen from aloft.

The best directions that can be given for entering are, to bring the outer extreme of Coal Point to bear N.W., and at a little more than a mile distant from it, when the depth will be 10 fathoms; when—being guided as well from aloft—a vessel should steer West, or for the inner North entrance point, which is low and sandy, and difficult to recognise from seaward, until a low sandy point on the South side of the river, 1½ mile inside Fox Point, is in line with Koti Kau, a cliffy point 20 ft. high, nearly a mile beyond the low sandy point, bearing W.S.W., which will lead to an anchorage in 7 or 8 fathoms, 1¼ mile inside the entrance.

GREAT EXHIBITION BAY, the extensive bay which is formed by the coast to the southward of that just described, was named by Cook *Sandy Bay;* he found bottom in it at a great distance off the land. Its S.E. limit may be taken as being at Cape Kara-kara, but the straight sandy beach runs S.S.E., nearly 11 miles from the South point of Parenga-renga, and terminates in a cliffy point named *Paxton*. From Paxton Point to Granville Point the coast trends S.E. by E., 7 miles; immediately to the North of the latter point is *Henderson Bay*, a sandy beach 2 miles in extent. Off this point also are two small islands, *Simmond Islands*, bearing North, half a mile and 1 mile distant from it.

Mount Camel, or Ohoura, is remarkable; its first appellation was given by Cook. It stands isolated, in the midst of low land, bordered on the coast by the sand downs previously mentioned, the dazzling whiteness of which fatigues the eye. The land itself consists of low hills or swamps, here and there interrupted by bluffs and basaltic rock.

Mount Camel itself is not connected with any chain of mountains, but forms an isolated hill, and rises to the height of 820 ft. above the sea. It has been erroneously called Mount *Carmel* by many late writers. This mountain protects a deep inlet, *Ohora River*, which at its head branches off into several shallow channels, and forms a perfectly sheltered harbour for vessels, with anchorage close to the eastern shore; the entrance to this harbour is about 100 yards broad, allowing vessels of 15 ft. draught to enter. In *Ohora Bay*, about a mile to the N.E., there is good anchorage in 5 to 7 fathoms.

Cape Kara-kara forms the eastern point of *Rangaounou Bay*, and is an offset of a hilly ridge which separates the latter from Doubtless Bay. Some islets and rocks named *Moturoa* extend for 3 miles westward of it.

Rangaounou Bay extends 12 miles from East to West, and is 6 miles in

depth; across its entrance there is from 20 to 25 fathoms water, and 10 fathoms within a mile of the shore. The river *Rangaounou* or *Awanui* lies in the depth of it. The eastern head of this river, *Blackney Point*, has some rocks above water, stretching half a mile to the N.W. of it—Motu Tara—and one two-thirds of a cable off it, awash. This head bears from the outer Moturoa Islet (which latter may be rounded close) S. by W. ¼ W., 6½ miles. The channel between the shoals at the entrance of the river has 7 fathoms in it.

South-east of Cape Kara-kara, 5 miles distant, is *Knuckle Point*, the western entrance point of Doubtless Bay. *Matai Bay* is midway between the two, and is divided by a narrow peninsula into two inner bays, Ohunga-hunga and Waikate. The western, *Ohunga-hunga*, has the best anchorage in 5 fathoms, sand bottom; the eastern, *Waikate*, is full of rocks. The only danger in entering Matai Bay is a rock in mid-entrance, just covered at high water, which has 25 fathoms round it. *Ororua Bay* is immediately to the N.W. of Knuckle Point; it has also a rock at its entrance, bearing N.N.W., little more than half a mile from the point.

DOUBTLESS or Lauriston Bay, the *Oudou-oudou* of the natives, received these names from Cook and Surville, who singularly were here at the same time, without knowing of each other's presence. Surville anchored here in the *St. Jean Baptiste*, December 17th, 1769, and named it Lauriston Bay, after the name of Governor Laws. He experienced a violent storm while on shore in a cove which he named *Refuge Cove* (Anse du Refuge). Here he was received with the greatest kindness and hospitality by the native chiefs, which, unhappily for the credit of humanity, met with but a sad recompense, for on his departure he took his friendly host, bound a prisoner, with him, and set fire to the houses and villages, and burnt all the canoes on the beach. This unprovoked attack led to the disastrous result of the murder of the unfortunate Capt. Marion, who came into the Bay of Islands afterwards.

A depth of 24 fathoms will be found across the mouth of Doubtless Bay, which is 5½ miles wide, and the only dangers are *Albert Rocks* and *Fairway Reef*, on its eastern side; the former are two rocks nearly 2 cables apart, well out of water, with 10 fathoms between them. They lie W. by S. ¾ S., 2¼ miles from the islet off Flat Head, the S.E. point of the bay. Fairway Reef is nearly one-third of a mile in extent, partly above water and partly awash; it lies S.W. ½ W. 4 miles from Flat Islet, and 1½ mile S.W. by S. from Albert Rocks. There is a channel of more than a mile in width between these dangers and the eastern shore of the bay; any vessels bound to Monganui Harbour from the eastward always pass inside them.

Monganui Harbour is more adapted for small than for large vessels, although it has afforded shelter for several whale ships together. It is 1½ cable wide at the entrance, and has an average width of nearly 2 cables for a distance of three-quarters of a mile in a S.E. direction; it then expands into extensive mud flats.

The least depth between the heads at low water is 4 fathoms, and they may be passed within 50 yards. Large vessels must anchor in the centre of the stream, and should moor; 4 fathoms will be found 3 cables within the heads, the water then shoals to 3 fathoms, and deepens again immediately above some rocks which extend above water off the North shore little more than half a mile inside the North head. These rocks narrow the width of the channel to 1½ cable; above them is the best and most sheltered anchorage for a vessel going to make any stay. She should drop her anchor in 4½ fathoms, just after passing the rocks, and moor; 2 cables above them the water shoals very suddenly.

Coasters may lie in 10 ft. at low water abreast White's Point, but not so high up as to open out the magistrate's house, which is on the upper South point of the harbour, nearly half a mile above the rocks, and 1 mile from the entrance. There is good anchorage outside the harbour in 6 and 7 fathoms, in moderate weather. Supplies of meat and vegetables can be obtained from the settlement.

It is high water, on full and change days, at 8^h 15^m. The range of tide is from 5 to 7 ft. The tides run in the harbour from 2 to 3 knots, and with N.W. winds a swell sets into the entrance.

In a sandy bay immediately to the westward of the harbour *coal* is found in seams, but it is of very inferior quality. There is a rock above water a quarter of a mile off the West point of this bay, 1 mile from the harbour's mouth; and on either side of it, East and West, at the distance of nearly 2 cables, is a rock awash at low water.

WANGAROA BAY and HARBOUR.—*Stephenson Island* (Mahinepua), whose S.E. extreme bears N.N.E., 2½ miles from the entrance of Wangaroa, is an excellent mark for it. It is high, and tapers gradually to its N.W. extreme, where it is nearly divided. It affords considerable shelter to the bay, and has good anchorage within it. *False Head*, a remarkable straight bluff, is 1 mile West of the entrance. A rock is reported to lie rather close in-shore, about 1½ mile S.W. from the West head of the bay, and which breaks with but very little swell on; the position, however, is doubtful.

From Flat Head or Point Surville to the entrance of this harbour, a distance of 11 miles, the coast is cliffy and steep, consisting of fragments of volcanic rock, very firmly cemented together into conglomerate. The entrance into Wangaroa Harbour is formed by towering perpendicular rocks of the same description, and is only 250 yards broad: it looks as if the solid rocks had been rent asunder by an earthquake, and the steep opposite sides had undergone a continued friction before they parted. Deep fissures penetrate the coast, and high cubical masses are piled one above the other in-shore, to the height of several hundred feet. The water in the entrance is of great depth close to the rocks, and there is no sunken rock or other hidden danger below the surface. The South side of the harbour is likewise rocky and much fissured. The

harbour itself is very spacious and deep, possesses anchorage for the largest fleet, and is sheltered from all winds. As a harbour, it ranks with the best in New Zealand.*

The most convenient anchorage is in *Kaouou Bay*, on the western side of the harbour, immediately inside the entrance. There are two rocks in this bay, nearly awash at high water; they are a cable's length apart, with 9 fathoms between and deep water all round. The outer one bears from the inner western entrance point, which is a small rocky peninsula, W. by S. ½ S., nearly 4 cables' lengths. These rocks may be passed on either side. A shoal of 15 ft. extends nearly 2 cables northward of Middle Head.

Peach Island, a high, remarkable looking island, lies in the centre of the harbour half a mile from the entrance, at the entrance of *Owanga Bay* on the East side; there is deep water all round it. The most remarkable objects in this singular harbour are two cupola-shaped hills, *Mounts St. Peter* and *St. Paul;* they lie on opposite sides of the harbour, 2 miles from the entrance. St. Paul, on the eastern shore, is a striking feature, resembling the dome of that cathedral, hence its name. The water at the head of the harbour within the line of this mount is shallow, and mud flats dry for a mile off the shores.

On the West side at the head of the harbour is the French Roman Catholic mission establishment. Vegetables and fruit, including grapes, peaches, &c., are cultivated here to a considerable extent, and with much success. Fresh water may be had from the streams in any of the bays.

At 8 miles to the East of Stephenson Island is a group of about fifteen islets of 5 miles in extent, the largest of which, not more than 4 or 5 miles in circuit, is called *Motu Kawa*, and the next, very much smaller, is named *Panake*. They are the *Cavallis* of Cook.

Between this group and the land there is a channel, with 17 ft. least water, half a mile wide, practicable for small vessels; but there is a rock awash at high water in mid-channel, between the Great Cavalli and the main land. M. Blosseville states that you may anchor in 8 or 9 fathoms under the largest

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* Dieffenbach, vol. i. p. 235. Wangaroa was the scene of a dreadful tragedy in 1809, the massacre of the crew of the *Boyd*. This vessel, of about 500 tons, left Sydney under the command of Capt. John Thompson, taking with them two New Zealanders, chiefs in this district, as sailors. One of them, George, was sea-sick, and incapable of duty; this irritated the captain, who not only treated them with great indignity, but caused him to be flogged. His revenge was a terrific one. With a singular temerity, the *Boyd* was taken into Wangaroa, and the chiefs dismissed. The natives collected, and hearing of George's wrongs, murdered the captain and boat's crew immediately on their first landing, and then proceeded to the ship and destroyed all on board but four, who had concealed themselves until the savages were satiated with slaughter. Their bodies, nearly seventy in number, were then eaten, and the ship burnt to the water's edge. The particulars of this awful retaliation for unjust treatment, a warning to commanders, will be found in "Nicholas' Voyage to New Zealand," vol. i, p. 144 *et seq.*

of the islands. A sunken rock is reported to lie about 1 mile E.N.E. of the island.

At 16 miles E. by S. from the entrance of Wangaroa is *Point Ngatoka-Rarangui*, the eastern point of Tako Bay, which may be recognized by three needle rocks lying under the land. At 4 miles farther on is *Cape Wiwiki* or *Wivia*, the western entrance point of the Bay of Islands. Off this cape are three small islets, the outer one of which, called *Tiki-Tiki*, or the *Ninepin*, is only a black rock, bare, and placed on end like a pyramid.

The BAY of ISLANDS, during all the early intercourse of Europeans with New Zealand, was the principal rendezvous in the group. But since the establishment of other settlements this has proportionately declined, though its many natural advantages and coal supply will still cause it to maintain some importance.

The opening of the bay is not less than 10 miles in extent between Capes *Wiwiki* or *Pococke*, and *Rakaou* or *Bret*, and it has an average depth of 8 miles. It would have but little shelter, from its being open to the N.E. winds, if it were not from the numerous islands and peninsulas dispersed throughout it, and forming excellent anchorages.

On the North side is the small cove of *Tepuna* or *Ranghihoua*, very commodious for small vessels. Then comes the *Tepahi* or *Tippahi Islets*; next the Port of *Té Paona*, much better sheltered than the preceding; on the western shore the *Kidi-Kidi* or *Keri-Keri River* follows, impracticable for ships, but exceedingly useful for canoe communications with the interior. The island of *Motu Roa*, with the naked islets to the East of it, lies to the S.E. of the entrance. To the South of this is *Brampton* or *Favourite Bank*, surveyed, as was the whole of the bay, by M. La Place, in 1831. To the South of this is the mouth of the *River Waitangi;* then, to the South of this, is the mouth of *Wai Kari River*, a projecting peninsula forming good anchorage in its western side, in the *Bays of Kororarika* and *Mata-Uki*, and which terminates in *Points Tapeka* and *Wayhihi*. To the East of this is *Pa Roa Bay*, fit only for boats; but *Port Manawara*, to the East of this again, is very safe and commodious for vessels not exceeding 300 or 400 tons, for the sand-banks off its mouth render the approach of larger vessels difficult. Another and very narrow peninsula separates Manawa Bay from *Rawita Bay*, where Marion first anchored. This forms an extensive basin, sheltered from the winds from the offing by the islands of *Motu-Arohia*, *Motu-Rua*, *Motu-Keke*, and a crowd of others, which caused Cook to apply the name to the bay.

During the colonization of New Zealand there was considerable discussion as to the eligibility of the site of its future capital, and one of these sites was that of *Russell*, North of Paheha, which was named as the temporary seat of government, but which was deserted at the erection of Auckland as the capital.

Paheha, or *Paihia*, was the principal episcopal missionary establishment. It

is pleasantly situated on the bay opposite Kororarika, but is too much exposed to afford a good harbour for shipping.

Kororarika may be termed the principal commercial settlement in the bay, but scarcely deserved the name of a town in its early days. It then consisted of about twenty poor houses, and numerous shanties, inhabited by a low and lawless race, and acquired the cognomen of "Blackguard Beach." A small town sprang up, but the difficulty of land communication was a serious drawback to it. But in 1845 it was totally burnt and plundered by the natives, during John Hekés rebellion.

The Tides within the Bay of Islands are not much felt, except at the narrow entrance of the rivers, where they run from 1 to 2½ knots per hour. In the Rawiti, one knot an hour is about their greatest strength, the flood running to the westward, and the ebb to the eastward. It is high water, on full and change, at Kororarika, at $7^h\ 15^m$; the tide rises from 6 to 9 ft.

CAPE WIWIKI, as before mentioned, forms the western entrance point of the bay; it is a steep bold headland, its summit, Mount Pococke, being 843 ft. high. It is a dark coloured mountain, rising abruptly on its northern and eastern sides, with the southern slopes well wooded nearly to the summit.

Immediately off the cape, scarcely half a cable's length distant, is *Motu Galakek*, or the *Sentinel*, a small island of moderate height, and half a mile N.E. of this is the *Ninepin* (*Tiki Tiki*), a high black pinnacle rock, 40 ft. high, with a passage between 3 cables in width, with 12 fathoms water. This isolated and very remarkable rock is an excellent guide for a stranger, and may be distinctly seen from a distance of 12 miles.

One mile southward of Cape Wiwiki is *Howe Point*, and midway from the coast between them projects a high round-topped cliffy peninsula, connected with it by a low neck. Between Howe Point and the island *Motu Roa*, the latter situated 2 miles South of the former, is the passage to the western anchorages of Port Tepuna and Keri-Keri River.

Off the northern and eastern ends of Motu-Roa lie Black Rocks, so called from their colour; they are a remarkable group of smooth flat-topped rocks, about 15 ft. high, steep, and with no dangers about them.

At a quarter of a mile S.W. from Howe Point, is a small rock above water; and 1½ mile westward of the point is *Tepuna* or *Rangihoua Bay*. Here the first missionary station was established in New Zealand, and there are still the houses of settlers. There is anchorage in this bay in 5 and 6 fathoms, sandy bottom, but it is open to easterly winds. Immediately to the westward of Rangihoua Bay are *Tepahi Islands*, four ragged looking islands, with shoal water between. A round rock, well out of water, and nearly 2 cables in circumference, lies half a mile to the eastward of them; and between this rock and the West point of Rangihoua Bay, a quarter of a mile from either, is a sunken rock which breaks at low water.

Onslow or Howe Rock, the only danger to be avoided, lies in the outer

entrance, between Howe Point and Black Rocks; it has 17 ft. on it at low water, and is a perfect pinnacle, with 15 fathoms close-to. It lies S.S.E. three-quarters of a mile from Howe Point; when on it, the extreme of the projecting peninsula midway between that point and Cape Wiwiki, is in a line with the low western neck of Galakek Island, bearing N. ½ W., and the extreme of Porae-nui Point, bearing S.W. by W. ½ W., is seen to the northward of the North end of Cocked Hat Island, a low triangular shaped island, three-quarters of a mile beyond it.

There is a passage of nearly three-quarters of a mile wide between Howe Point and this rock, with 16 fathoms water, and the point may be passed as close as is convenient.

When abreast Porae-nui Point, which has an isolated hummock on it, surmounted by a remarkable tree, *Port Te-puna* runs to the W.N.W., its entrance being between it and the middle point, which latter is W. by S. three-quarters of a mile from Porae-nui: Keri-Keri River taking a westerly direction, and having the low stony triangular Cocked Hat Island lying in the centre of its entrance.

The *Brothers* and *Slains Castle Rocks* are between Porae-nui Point and Cocked Hat Island, rendering the approach with a working wind somewhat difficult for large vessels. The Brothers are two rocks more than half a cable apart, awash or breaking, and are consequently easily avoided; they lie S. by W. from Porae-nui Point, the northernmost rock being 2 cables distant from it, with a rocky patch of 17 ft. extending half a cable to the northward. Slains Castle Rock is sunken and dangerous; it lies W. ¾ N., a quarter of a mile from the centre of the Brothers, in a line between them and the Middle Point, and S.W. by W., 4 cables from Porae-nui Point. It has 8 ft. on it at low water.

Port Tepuna is a spacious and well-sheltered anchorage, though rather shallow for vessels of large tonnage to enter far. It is more than half a mile in width at the entrance, and a short distance within expands to a mile. The deepest water is on the southern shore, where there is 5 or 6 fathoms for half a mile above the Middle Point, 4 fathoms more than a mile above, and again for another mile above, 3 fathoms at low water.

Keri-Keri River, although apparently an extensive sheet of water, is only navigable for boats above the anchorage in 5 fathoms, 1½ cable from the North shore, and three-quarters of a mile above Cocked Hat Island.

Tapeka Point.—From the easternmost Black Rock, Tapeka Point, the northern extreme of Kororarika peninsula bears S.S.E. nearly 2 miles; several detached rocks well out of water, and on which there is generally a break, extend for nearly a quarter of a mile from it; they are all visible, and may be passed within half a cable in 6 fathoms.

Between Tapeka and Manawaroroa Points, which latter is directly West of the former, 1¾ mile distant, is the entrance to Kororarika, and the southern anchorages; this entrance, however, is contracted to little more than half that

width by Brampton or Favourite Bank, which extends more than three-quarters of a mile off Manawaroroa Point or Flat.

Brampton or *Favourite Bank.*—The southern limit of this bank commences at the South point of Hume Creek, which is 3 cables South of the southern part of Manawaroroa Point or Flat, and its northern at more than half a mile from the North end of the flat. The depth of water is from 6 to 15 ft., and it shoals suddenly from 5 fathoms to the latter depth. The outer extreme of the easternmost Black Rock, in a line with the Ninepin, bearing N. $\frac{3}{4}$ E., leads directly on the tail of the bank, and the extreme of the Black Rock in a line with the outer extreme of Motu Galakek clears it $1\frac{1}{2}$ cable outside in 6 fathoms.

KORORARIKA BAY and Anchorage.—A vessel entering with a leading wind should keep a quarter of a mile outside the rocks off Tapeka Point—as also the point next to it—and Kororarika Point, as off these points rocks lie scattered above water. On passing the latter point the town will open out, and the best anchorage is in the centre of the bay in 4 fathoms, mud, with the rocks off Kororarika Point bearing N.W. $\frac{1}{4}$ N., and the western end of Motu-roa Island well open of them; with Motu-roa Island shut in, there is only 15 ft. water.

Off the South point of Kororarika Bay is the small rocky islet *Kairaro*, or *Observatory Islet*, 60 ft. in height, which can be advantageously used as a leading mark to clear Brampton Bank. Working up for Kororarika anchorage, a vessel may stand to the westward without fear until Observatory Islet is just opened out to the southward of Kororarika Point, when she will be in not less than 6 fathoms, and must tack to the eastward.

Hermione Rock is another danger which must be avoided in working up. It is a patch with 2 ft. water on it at low springs, and which very rarely breaks; from it Mr. Busby's house, a prominent object on the North side of Waitangi River, bears S.W. by W., and it lies from Kororarika Point, S.W. by W. $\frac{1}{4}$ W., 11 cables, and 4 cables off shore.

Motu Mea Island, a narrow island, one-third of a mile in length, lies off the entrance of Waitangi River, and is connected with the main land by a ridge.

Waitangi River is S.W. $1\frac{1}{2}$ mile from Kororarika Point. Small vessels enter this river, and they must either pass between Hermione Rock and the shore in $3\frac{1}{2}$ fathoms, or between the rock and Motu Mea; 5 ft. is the least water at the entrance at low springs, and 12 ft. inside. Vessels can proceed a very short distance up; with strong N.E. winds a swell sets into the river. It is high water, on full and change, at Motu Mea Island, at $7^h\ 15^m$; springs rise 9 ft.; neaps 6 ft.

PAIHIA VILLAGE (the Church mission station) is in a sandy bay to the southward of Motu Mea. There is no good anchorage in the bay, as the water shoals for a considerable distance, and it is exposed to northerly winds. The lights of Paihia village at night will be found a guide to clear Brampton Shoal; when they are seen to the eastward of Motu Mea, a vessel is to the

eastward of the tail of the bank. To the northward of Manawaroroa Point, however, they would not be available, as a vessel may stand far enough to the westward to open them out westward of the island.

The small island of Motu Arahi, or Paihia Islet, lies about a cable off the South Point of Paihia Bay, and on the opposite shore is *Toré Toré Peninsula*. The distance between these two points is 4 cables, and they may be said to be the entrance points to the upper anchorages.

WAHAPU BAY.—On the eastern shore above Toré Toré Peninsula are two deep bights, Wahapu and Pipi-roa. The former, which is immediately round the peninsula, is the military station of the district, and there is anchorage off the barracks for vessels drawing 8 ft. The latter is a shoal double bay; the South point, Okiato, will be known by a large wooden house being built over it.

From Toré Toré to Tapu Point, the North entrance point of the rivers, or more properly speaking the inlets of Waikari and Kaua-Kaua, is 1¾ mile in a S.E. by S. direction, with a narrow deep channel.

Waikari River.—*Tapu Point*, the northern entrance point of the inlets, is a rounding flat-topped grassy point, of peninsula formation; the distance between it and the southern entrance point being a quarter of a mile, with 11 fathoms water between them. From here the Waikari turns to the eastward for 2½ miles, being navigable for coasters for that distance, where there is a small island lying in the middle of the stream.

H.M.S. *Basilisk*, in 1873, anchored in Waikari River for the purpose of obtaining coal off the mouth of *Kawa Kawa* River in 10½ fathoms, with Waikari Island E. by S. ¾ S., and Waimangaroa Point S.W. by W. The passage to this anchorage from Kororarika Bay is narrow and intricate for large ships, but may be rendered easy if buoyed. A government pilot is stationed at Kororarika. *The coal mines* in the Bay of Islands are situated about 5 miles up Kawa Kawa River, which is shallow and full of mud banks, only available for small coasters at high tide.

The coal was brought alongside the ship in lighters holding from 80 to 100 tons; the price charged being sixteen shillings per ton. The coal is small, but generates steam rapidly; it produces a thin clinker, and little ash. The tubes rapidly become choked from the great deposit of soot. The smoke is very dense and dirty as compared with Australian coal. The following results were obtained on board the *Basilisk*:—Average distance run per ton of coal—Newcastle, New South Wales (which costs 40 to 50 shillings a ton here), 10 miles; Bay of Islands, New Zealand, 7·4 miles.

The Kawa Kawa Colliery has been worked since 1868, and now produces about 50,000 tons per annum. A railway was in course of construction to convey the coal to a wharf at the river entrance, with a depth of 40 ft. alongside it.

KORORARIKA, or Port Russell, is the only place in the Bay of Islands at present of any commercial importance, and ships requiring supplies must proceed to this anchorage. A resident magistrate, as well as 237 European settlers (in 1881), are established here. Vessels requiring refit may obtain almost any stores they may stand in need of, in addition to live stock, provisions, and refreshments; there is bi-weekly steam communication with Auckland. Water may be had from a stream at the North end of the bay, but not so good, and with less facility, than at the stream above Toré Toré Peninsula. Oysters abound on the rocks, below high-water mark, in all parts of the bay, except in the immediate neighbourhood of the settlements, and indeed on the whole extent of the East coast as far South as Auckland.

Light.—A *fixed red* light, elevated 20 ft., and visible 2 miles, is shown from a lamp-post on the extremity of the Government wharf at Port Russell. Good anchorage will be found in the bay with Kororarika Point bearing North, and the light N.E. by E. ½ E., in 4½ fathoms.

Numerous whaling vessels resorted to the Bay of Islands for refreshments and supplies before the regular colonization of the islands, but since then their visits have declined considerably.

The eastern portion of the Bay of Islands, which has now to be described, is included between Tapeka Point and Cape Bret, a distance of 11 miles, in a N.E. by E. and S.W. by W. direction. The part, however, which is sheltered by the islands, and available for anchorage, extends only 6 miles eastward of Tapeka Point, the remaining distance of 5 miles being a steep, cliffy, indented coast, without shelter as far as Cape Bret.

The RAWITI.—The extensive sheet of water included between the islands and the main land is called the Rawiti. The islands which constitute its northern boundary are six in number, besides several smaller islets and rocks; their greatest length, which is generally in a N.W. and S.E. direction, varying from three-quarters to 1¼ mile.

The southern shore of the main land is cut up into deep and extensive bays and creeks formed by the curiously-shaped peninsulas which are so characteristic a feature of New Zealand, and they afford excellent anchorages for vessels of moderate draught. The Rawiti itself is capable of containing and affording good shelter to any number of ships of the largest tonnage; still it is not without its shoals, and a due attention to the chart will be required to avoid them.

The western entrance is between Tapeka Point and Motu Arohia, the western island, and is more than 1½ mile in width, with a depth of 14 fathoms.

The *Eastern* or *Albert Channel* is between Orupukapuka, the eastern island, and Richards Peninsula, its width being not more than a quarter of a mile; small vessels rounding Cape Bret with a scant wind from N.W. avail themselves of this passage, as they can obtain anchorage when inside it, or work up in smooth water. Vessels in distress have also entered under the same circum-

stances; the *Hope*, whaler, which struck on a reef on the North side of the channel (since named after her) ran through into the Rawiti. This channel, however, is not fit for a large vessel; the ground is foul and irregular, and two rocky patches of 15 and 16 ft. lie in the centre of the entrance; there is also frequently a heavy swell setting into it, and it should not be attempted without a leading wind.

At 1¼ mile E. by S. of Tapeka Point is *Capstan Rock* (Outou Rodi), which, the natives assert, was not long since awash, and that they have grounded their canoes on it to fish; in this case its head must have been washed off by the sea, which is not improbable, as the bottom in the shoal places is of coral formation; it is now a mere point, with a least depth of 12 ft. on it at low water, and 7 fathoms close round; the position of this rock is little more than half a mile from the centre of Honiroa Beach.

Manawara Bay.—Immediately eastward of Paroa Bay, which is 2¾ miles eastward of Tapeka Point, and which is only separated from it by the narrow peninsula of the same name, is Manawara Bay; it runs to the south-eastward for 2 miles, terminating at Clendon Cove, which has only 10 ft. water a short distance within the entrance. There are also two bays on its eastern side, in both of which there is anchorage for small vessels.

There are two passages into the Rawiti, between the islands, which may be run for, if necessary. The first, half a mile wide, is between Motu Arohia and Motu Rua, the island East of it; there is a rock in this passage which is always visible, 1½ cable off the West end of Motu Rua.

The second island passage is between Okahi, or Red Island, and Keke. For a mile within Red Island, or as far as the West end of Orupukapuka, there is a channel of half a mile in width, with 9 fathoms in the centre, and not less than 3½ fathoms close to the shore on either side.

Whale Rock is the only danger in entering the Bay of Islands from the eastward, and generally breaks at low springs, or when there is any sea. There is a clear passage 4 cables wide, with 12 fathoms water between it and Red Head of Okahi, or Red Island, from which it bears N.W. by W. ½ W. half a mile.

From Richards Peninsula, on the S.E. side of the Albert Channel, the coast curves to the N.N.E. for 2 miles to *Deep-water Cove*, which from seaward would appear to offer shelter to a vessel. The water, however, is too deep for anchorage until within less than half a cable's length of the shore in the N.E. cove at its head.

Twins Rock, 3 ft. out of water, and about 100 yards in circumference, lies 1 mile North of the northern entrance point of Deep-water Cove, and is 3 cables from the nearest part of the coast.

From Deep-water Cove to Piercy Islet off Cape Bret is N.E. ½ N. 2½ miles, the shore steep and cliffy, with a swell generally setting on it.

CAPE BRET (not Brett), **or Rakaou**, so named by Cook, after Sir Piercy Bret, is considerably higher than any part of the adjacent coast, it rising to the

height of 1,220 ft.; at its point is a high round hillock, and about a quarter of a mile N.N.E. of it is *Piercy Islet*, a small high island or rock, which, like several, is perforated quite through, so as to appear like the arch of a bridge. When first seen from a distant offing, while no other land is in sight, it makes like a quoin-shaped island. As the sea around is free from danger, it is an excellent landfall for shipping approaching this part of the coast. *Bird Rock*, rising 2 or 3 ft. above high water, lies about a mile W. by S. from Piercy Islet.

Wangamomoo Harbour.—From Cape Bret the coast trends S. $\frac{1}{4}$ E. for 5 miles to the small harbour, Wangamomoo. The only danger between is a flat rock, 2 ft. out of water, which lies $1\frac{3}{4}$ mile South of Piercy Islet, a quarter of a mile off shore. Wangamomoo is the southern of two bays, somewhat similar in appearance when seen from seaward; the northern bay has several rocks scattered over it, and is without anchorage. The other is a snug anchorage for small vessels in 5 and 6 fathoms, but is not eligible for ships of large tonnage.

The peninsula which forms the southern side of Wangamomoo Harbour extends $1\frac{1}{2}$ mile easterly from the main land, forming a bight on its southern side, which trends south-easterly to Home Point, the northernmost point of Bland Bay: this bight offers no shelter. *Home Point* lies S.E., $4\frac{1}{2}$ miles from the South head of Wangamomoo. It is a remarkable flat-topped point, and only connected with the main by a narrow neck. Two cliffy islets lie at half and three-quarters of a mile South of this point.

Bland Bay is immediately to the westward of these islets; it runs in a westerly direction for $1\frac{1}{4}$ mile, and has a long sandy beach on its S.W. side, which is the northern side of the neck, separating it from Wangaruru Harbour; this neck is only $1\frac{1}{2}$ cable across. There are two rocks in the centre of the entrance which break at low water, or when there is any swell. The only shelter which this bay would afford within the head from easterly winds is to the westward of the line of rocky islets, and here there is not more than 2 fathoms of water, so that it is useless as an anchorage. *Danger Rock*, a black pinnacle rock, standing 8 or 10 ft. out of water, and steep-to, lies immediately off Bland Bay, 1 mile from the coast. From the South head of Bland Bay to the entrance of Wangaruru Harbour the coast is steep and bold, with no outlying dangers.

Wangaruru Harbour is S.S.E. 13 miles from Cape Bret, and lies in the N.W. corner of a bay 5 miles in length, of which Cape Home is the North point, and Wide Berth Islands the southern limit. It is a good harbour for medium sized vessels, well sheltered, and easy of access. It lies in a N.W. and S.E. direction, and is formed between the main land and the high peninsula which separates it from Bland Bay. *Henry Island*, 4 cables S. $\frac{1}{2}$ W. from Cape Home, lies in the entrance, and with the reef which extends off its southern extreme affords considerable protection from easterly winds. It is not above 2 cables in extent, and a reef of rocks awash runs off its southern end in the same

direction for nearly a quarter of a mile. Vessels may enter the harbour on either side of Henry Island. The passage to the northward is narrow, being a quarter of a mile in width, with a depth of 7 fathoms. After passing Henry Island, Black Rocks will be seen on the starboard hand; they extend a quarter of a mile to the southward from Grove Point, and the same distance off the land for half a mile to the eastward of that point, with 4 fathoms half a cable from their extreme.

The passage South of Henry Island is the widest and best. Vessels entering from the southward, after giving Wide Berth Islands a berth of 1½ mile, in 14 fathoms, should steer West, which will lead between Henry and Nops Islands; the latter bears S. by W. from the former 1¼ mile distant, is little more than a quarter of a mile long, and has two summits, which when abreast give it the appearance of two islands; they are connected, however, by a narrow neck of sand. When in mid-channel, between Henry and Nops Islands, steer N.W. ¾ N., or for Grove Point, and anchor in 6 fathoms. A reef, awash, extends 2½ cables S. by W. from the South point of Henry Island.

A snug and sheltered anchorage for vessels drawing from 10 to 12 ft. may be obtained half a mile northward of *Grove Point*, and about 3 cables off shore, 16 ft. at low water. There is a native settlement in the first bay North of the point, where supplies may be obtained from the natives; peaches and potatoes are in abundance. Fresh water may also be obtained from a stream in the bay, as well as from the Settlement Bay on the opposite shore. A sunken rock is reported to lie 3 cables South of the small islet which bears East, distant 6 cables from Hay Island.

Mimiwanga Bay, in the S.E. corner of Wangaruru Bay, is a mile in width at its entrance, and the same in depth. It lies S.E. ½ E. 4 miles from Henry Island, and is open to the northward. Coasters bound to the southward make a stopping place of this bay with southerly winds.

Wide Berth Islands are a cluster of high, rocky islets, lying in a N.N.E. and S.S.W. direction, and extending off the South head of Wangaruru Bay. The outer or north-easternmost lies E. by N. ¾ N. from the South head, 1½ mile distant, and the inner one is a quarter of a mile from the shore. Three reefs awash lie a mile to the southward of these islands, and bear from the outer islet from S.S.E. to S.S.W., covering a space of more than half a mile; these islands should generally be given a berth of 2 miles, unless with a commanding breeze.

From Wide Berth Islands to the North Gable, the coast trends S.E. ½ S. for nearly 11 miles; it is indented with several sandy bays, but without anchorages.

Elizabeth Reef, on which a vessel of that name was wrecked, lies off this part of the coast; it is 6¾ miles to the northward of the North head of Tutukaka Harbour, and bears from the outer Wide Berth Islet S.E. ½ S. 5 miles. It is half a mile in diameter, and its outer edge lies a mile from the shore. The

central part is awash at high water, and the sea always breaks on it. There is a narrow 3-fathoms channel between it and the shore.

The Three Gables are three remarkable gable-shaped headlands, lying in a N.W. by N. ½ N. direction, nearly a mile apart from each other, having bays between, which are rocky and unsheltered; the southernmost gable forms the North head of Tutukaka Harbour.

Poor Knights Islands (*Tawiti Rahi*) lie off this coast. They are two rugged-looking islands, about 200 ft. high, lying close together, and extending in a North and South direction 2½ miles; their North end bears from Cape Bret S.E. by E. ⅓ E., 26 miles, and their distance from the nearest point of the main is 11 miles. The water is deep, 64 fathoms around them, and there are no dangers. At 3 miles S. ½ E. of their southern extreme are three steep cone-shaped islets, and a fourth of the same character, S. ½ W., 4½ miles. These islets can be seen at a distance of 10 or 12 miles.

TUTUKAKA HARBOUR is 30 miles from Cape Bret, and 13 miles from the South head of Wangaruru Bay. It bears from the southern Poor Knight Island S.W. ½ S. 11 miles, and will be easily recognised by the three peculiar headlands mentioned above. It has always been a favourite coasting harbour, in consequence of its position with regard to Nongodo River (only 1½ mile to the southward), whence many of the native exports are derived. This river being difficult of access, owing to its intricate entrance, Tutukaka has been resorted to instead; a good native path connects the two, the distance being about three-quarters of a mile.

The North head of Tutukaka is nearly an island, being barely connected by a very sandy narrow neck, which the sea washes. What will appear as the South head in coming from the southward is also a cliffy islet, extending 2 cables from the coast, and almost joined to it by rocks. This islet bears from the North head S. by E. ½ E., 6 cables, and has two rocks lying off it in an E. by S. ½ S. direction; the outer rock is above water 2 cables from it; the inner rock breaks.

The true South head of the harbour lies W.N.W. half a mile from the above islet, and from it a rocky cluster extends above water towards the North head for a quarter of a mile, the largest rock being well out of water, and a cable in extent. Between this rock and the North head is the passage in; it is just 1 cable wide, and, when inside, opens out to 2 cables. The anchorage is 2 cables inside the rock in 4½ or 5 fathoms; a vessel will then be a quarter of a mile from Philipps Island, a high wooded islet which lies in the centre of the harbour, and distant W. by S. half a mile from the entrance rock. It is high water, on full and change, at 7^{h}; springs rise 9 ft., neaps 7 ft.

Tutukaka Harbour, it will be seen, is only fit for small vessels, though H.M.S. *Buffalo*, when waiting here for kauri spars from Nongodo River, lay for some time moored head and stern, which vessels of large tonnage must do. There is

generally a heavy swell setting on to the rocks at the South side of the entrance, and the direction of the tides in their vicinity is uncertain.

Nongodo River lies in the N.W. corner of a sandy bay, 1½ mile to the southward of Tutukaka. In this bay there is good anchorage with off-shore winds in 6 and 7 fathoms, sandy bottom; the river can only be entered in fine weather by coasters acquainted with the locality.

HAURAKI (or Shouraka) GULF.—This very extensive bay sprang into great importance by the colonization of New Zealand, inasmuch as the northern capital, Auckland, was established on one of the numerous harbours it contains. Like most other parts of the coast, we owe our first knowledge of its nature from the first voyage of Cook, in 1769, but his examination was confined to the great river, the Wai-Kahow-rounga, or the Thames, as he named it, which falls into its S.E. angle. All its western part remained comparatively unknown until 1827, when the lamented D'Urville entered and surveyed its S.W. parts in the *Astrolabe*, giving the name of his vessel to the strait formed by the islands in its southern part, a name now superseded by the native one of Tehmaki. It has since been completely surveyed by the English Admiralty, under Captains Stokes and Drury, and their directions, which follow, have superseded those formerly given.

CAPE TEWARA, or BREAM HEAD, of Capt. Cook, forms the N.W. limit of Hauraki Gulf. This remarkable headland is high, and rugged in the extreme, formed of large fragments of basaltic rock, piled up in most fantastic forms, which vary their appearance as the ship passes them. It is about 15 miles S.S.E. of Tutukaka, in lat. 35° 52′ 15″ S., long. 174° 37′ 30″ E.

Bream Islet, about 2 cables in extent, lies North from the cape nearly a mile; there are also three rocky ledges at distances of 1 and 2 miles from it. From 18 to 20 fathoms will be found a mile from the shore.

Bream Rock, a dangerous patch for vessels working to the southward, or rounding Bream Head for Wangari Harbour, lies N.E. by E. three-quarters of a mile from Bream Islet. It has 16 ft. water over it, is 33 yards in diameter, and breaks in rough weather.

WANGARI BAY.—Bream Head, the North point of Wangari Bay, is 42 miles S.E. by S. ¼ S. from Cape Bret. At 11 miles S. by E. from it is the Bream Tail (Papai Outou), a bluff of moderate height, and the southern limit of the bay, which is 7 miles in depth, running in a uniform curve to the westward, with a sandy beach of 10 miles in extent.

WANGARI HARBOUR.—From Bream Head the coast runs in a W. by S. direction towards the harbour, and is steep, with a continuation of the Bream Head mountain range rising abruptly from the sea almost to the same height for a distance of 3 miles, when it terminates in Busby Head, the East point of the harbour; to the eastward of Busby Head a bight runs in for half a mile, which is shoal, and should be avoided. Off the West pitch of Busby Head is a steep sugar-loaf cone, connected with it by a ledge; this may be considered

the entrance point. The coast from this turns directly North; and at a distance of half a mile is Home Point, with a hill about 200 ft. high over it. Round this point, in *Calliope Bay*, is the first anchorage, and a vessel should only shoot round it sufficiently far for protection from a S.E. swell, or about a quarter of a mile and 1½ cable from the shore, as the distance from it to Calliope Bank is scarcely 3 cables; this is only a small vessel anchorage.

From Home Point to *Lort Point* the distance and direction are 2 miles, N.W., and the space between is filled with *Calliope Bank*, nearly bare at low water, and so named from H.M.S. *Calliope* running on it in seeking shelter from a S.E. gale. On this flat is a small islet, three-quarters of a mile N. by W. of Home Point, and near the shore another and higher wooded islet, useful as a mark in entering, bearing N.W. by N. ½ N., 1½ mile from Home Point.

Abreast of Lort Point is a rounding sandy point; between them is the entrance to the Inner Harbour and River. But off and around this Sandy Point is Mares Bank, which stretches off towards Home Point and Busby Head, leaving a channel of only one-third of a mile wide. Close off Lort Point is another wooded islet, and the inner and preferable anchorage for large vessels lies N.W. by W. 4 cables from this islet, in 5½ fathoms. The banks of the channel are rather steep, and if a vessel gets into 4 fathoms on either side she is too close.

From the nature of the entrance and anchorages between large sand-banks, and looking to the numerous accidents which have occurred from trusting to the permanence of the marks and positions of such channels, we have great diffidence in giving any directions based on the survey of 1849, and must therefore leave them to the sailor's well-known caution and the use of the lead.

It is high water, on full and change, at the lower anchorage, at 7^h; the rise is from 7 to 9 ft., and the tides run 3 knots.

Wangari River.—The passage between Lort Point and the western sandy point is half a mile wide, and may be considered the entrance of Wangari River. Above these points it opens out to a width of 2 miles; the South shore is low and swampy, while the North is overlooked by hills of considerable height.

There is a channel of 3½ fathoms at low water as far up as Limestone Island, a distance of 8 miles; and it preserves an average width of nearly a quarter of a mile. With the exception of this channel the water is shoal, with numerous flats, dry, or nearly so, at low water. To make the river generally available for vessels of large tonnage, it would require to be buoyed in several places; but with care and attention to the large chart, anchorage as high up as Single-tree Point, 2¾ miles above the entrance, may be obtained without any other aid.

On the North side of Wangari Harbour, in Parua Bay, is the Cape Breton settlement, and higher up, opposite Limestone Island, is Mangapai. The village of Wangari, or Whangarei, is 15 miles inside the heads, and the centre of one

of the most fertile districts in the province. There is also abundance of coal, limestone, iron, building-stone, &c., in the district.—*New Zealand Almanac.*

A railway is being constructed from the *Collieries* to the loading ground, with 22 ft. alongside the wharf at low water. The price of the coal is about 10s. per ton.

Fresh water may be obtained at either of the lower anchorages. At the first, in Calliope Bay, there is a small river half a mile above the anchorage, where it can be got with much facility. At the Passage Islet anchorage there is a stream running through a stony beach abreast the anchorage.

Waipu is a river about 4 miles South of Wangari Harbour; inland about 2 miles it spreads into four branches, each navigable for small vessels 2 or 3 miles; there is a bar entrance, but vessels enter with perfect safety. *Mackenzie Cove* is outside Waipu River, where the anchorage is safe with North and N.E. winds. Passengers, cattle, &c., are landed here; the distance to Wangari is 12 miles, and to Auckland about 60 miles.

MORO-TIRI ISLANDS, or the Hen and Chickens of Cook, lie off Wangari Bay. They form a narrow and rugged ridge. Captain Cook, who passed here, and caught a large number of sea-bream, November, 1769, says that Bream Bay and Head, as he calls Wangari Bay and Cape Tewara, may be known by these Hen and Chickens, one of which is high, and terminates in two peaks. About 15 miles to the eastward are Moko-hinou Islands, on which is a *lighthouse*, hereafter described.

Taranga Island (the Hen), of the Chicken group, lies 2½ miles to the southward of the Chickens. It is 2½ miles in length East and West, and 1 mile North and South, and has a high and remarkable double peak on its western end, somewhat resembling Bream Head. At 2 miles to the southward of the West end of Taranga Island is *Totourou*, or *Sail Rock*, a steep islet resembling from many points of view a fore and aft schooner.

McGregor Rock, a small patch with 11 ft. water over it, lies nearly midway between Bream Tail, the southern point of Wangari Bay, and Totourou or Sail Rock. From it Bream Island bears N.W. by N. ½ N., and Sail Rock N.E. ½ E., 2¾ miles.

From *Bream Tail* the coast trends S.E. ¾ E. to *Rodney Point*, so named by Cook, 19 miles. It is almost straight, with long sandy beaches, but in the neighbourhood of Rodney Point the coast is hilly. *Mount Hamilton*, a remarkable wooded eminence, with a double summit, rises to a height of 1,300 ft., 6 miles to the westward of it.

About 2½ miles South of Bream Tail is *Mangawai*; it has a narrow bar entrance, which is not practicable during easterly winds, and is poled off to guide coasters to the landing-place, 4 miles from the entrance. This is the nearest harbour on the East coast to the heads of the Otamatea and Oruawharu branches of Kaipara River.

A mile South of Rodney Point is *Little Oma Cove*, a double-headed creek, where coasters frequently find a stopping place in N.W. winds.

Great Oma Bay is 3 miles South of Rodney Point, horse-shoe shaped, and 3 miles in depth; there is anchorage in it with off-shore winds in 5 to 9 fathoms, but it is exposed to easterly winds, when a heavy swell rolls in. *Takatau Point*, 3 miles to E.S.E., is a long remarkable-looking point, with several cone-shaped rocks standing on its extreme.

KAWAU ISLAND.—At 1¾ mile southward of Takatau Point is Kawau Island, 3½ miles in extent North and South, and about the same East and West. It is now (1868) owned by Sir George Grey, K.C.B., who has built a handsome mansion on the shores of Fontelaye Bay, and is rapidly cultivating and improving his property. The island has been stocked with wild cattle, sheep, elk, deer, kangaroo, and various sorts of birds; every rare plant that will live at Madeira flourishes at Kawau, the climate being similar to that of St. Michael's, in the Azores. The copper mines have ceased to be worked.—*Capt. Palmer*, H.M.S. *Rosario*.

The island is hilly and well wooded, its average height varying between 500 and 600 ft. On its S.W. coast a copper mine was worked, adjacent to which, on the West side, is *Bon Accord Harbour*, with good anchorage for the largest vessels; immediately North of this harbour is the North cove, an anchorage for small vessels.

To the westward of Kawau Island is an extensive inlet, known as Kawau Bay; it extends westward for 4 miles, and is about the same in extent in a North and South direction; it has a depth of from 4 to 6 fathoms in almost every part, and in the N.W. corner is Mata Kana River, which is navigable for coasters.

There are three channels to Bon Accord Harbour and Kawau Bay, viz., the North, South, and Inner Channels. The North Channel lies between Takatau Point and the North shores of Kawau Island; the South Channel is between the South side of that island and Kaitu-kala Islands, which lie to the S.W. of it. The Inner Channel, which is convenient for vessels from Auckland, or from the southward, and the easiest for navigation, is inside the islands Ora and Kaitu-kala, or between them and the mainland.

The *North Channel*, which is recommended for a vessel from the northward with a leading wind, or indeed with any wind but a strong westerly one has the following dangers:—*Maori Rock*, awash at low water, a cable in extent, lies S. by W. 9 cables from Takatau Point. *Fairchild Reef*, a large flat rock just above water, bears from Takatau Point South 1½ mile, and from Kawiti Point, the North point of Kawau Island, E. ½ N. nearly a mile. A *shoal* of 8 ft. at low water bears West 3 cables from Kawiti Point, and *Iris Shoal*, 6 cables in extent, with 20 ft. least water on it, bears S.W. by W. nearly 1½ mile, with a deep-water channel between.

In working through the North Channel it must be remembered that a tide

of more than 3 knots runs there at the springs. The passage between Maori Rock and the rock above water on the Kawau shore is the best, there being a clear distance of more than half a mile between.

The passage North, or inshore of Maori Rock, is barely a cable wide, and should not be used unless under favourable circumstances, or by those acquainted with the channel, and when the rock is visible.

A good mark for Maori Rock is the northernmost Mayne Island, in Kawau Bay, in a line with Kawiti Point, which leads directly on it; and vessels passing in or out of this channel may be certain that when Mayne Island is not open of Kawiti Point, they are to the southward of the rock.

Bon Accord Harbour lies about the centre of the West side of Kawau Island. It runs in an East and West direction for 1¼ mile, and is three-quarters of a mile wide at its entrance. At half a mile inside its entrance (which is as far as a large vessel should go), it is half a mile wide. There are several bays on its South shore; in Momona, the outer bay, were the residences of the director and workmen of the copper mine. Small vessels may anchor here, but must remain with a fresh wind from the northward or westward. In a bay on the North side of the harbour, abreast this anchorage, fresh water may be obtained with much facility. *Smelting Cove*, on the North shore of Bon Accord Harbour, is a mile from the North head. There was a large smelting establishment in this cove.

Nearly half a mile S.W. ¾ W. from Momona Point—the southern head of Bon Accord Harbour—is *Martello Rock*, so called from its resemblance to a martello tower; it is surrounded by a reef, and directly westward of the mouth of Bon Accord Harbour, at a distance of 1¼ mile, are *Mayne Islands*, two small islands lying in a N.N.W. and S.S.E. direction, and half a mile apart, with a reef lying between.

Eclipse Shoal, discovered by H.M.S. *Eclipse*, Commander E. R. Freemantle, lies between Mayne Islands and the entrance to Bon Accord Harbour. It is nearly circular, about three-quarters of a cable in extent, with 2¼ fathoms on it. It lies with the middle of North Mayne Island bearing W. by S. ¼ S., distant about 4 cables, and with Fish Point just shut in with South Mayne Island.

Dispute Cove is a small cove on the South side of Kawau Island, a mile to the S.E. of Bon Accord Harbour. The copper mine (now disused) is on the North side of this cove, and small vessels used to anchor off it in fine weather. There is no shelter with westerly or north-westerly winds.

The southern and eastern sides of Kawau Island may be passed within less than half a mile in 14 fathoms.

Flat Rock Beacon.—At 2 miles E. by N. ½ N. from the S.E. point of Kawau Island, lies Flat Rock, 4 ft. out of water, and steep-to all round, resembling in size and appearance the hull of a large boat. It is distinguished by an iron beacon, with cage, surmounted by a diamond, painted black. A sector of *red* light is shown in this direction from Tiri-Tiri Island lighthouse.

Nelson Rock, having 9 ft. water on it at low springs, with 5 to 10 fathoms close-to, was discovered by the British ship *Nelson* striking on it, in the passage between Flat Rock and Kawau Island. It lies 4 cables from the shore of Kawau, with the S.E. point of that island bearing S. by W. $\frac{3}{4}$ W.; Flat Rock E. $\frac{1}{4}$ S.; Tiri Tiri lighthouse S. by E. $\frac{1}{2}$ E.; and Takatau Point N.W. by N.

It is high water at Bon Accord Harbour, on full and change days, at $6^h\ 30^m$; rise from 7 to 10 ft. The flood runs to South, and the ebb to North, with considerable velocity.

South Channel.—Kaitu-kala Islands, between which and Kawau Island is the South passage, are two small islands, with a passage $1\frac{1}{2}$ cable wide between them, with 9 and 10 fathoms.

The impediments to navigation in this channel are Beehive Islet and Reef, Passage Reef, and Albert Shoal. The *Beehive* is a remarkable cone-shaped islet, with a white sandy beach and reef round its base; it may be passed on either side. The clear passage between it and Kawau Island is 3 cables wide, with not less than $4\frac{1}{2}$ fathoms water; if this passage is taken, a vessel should steer in direct mid-channel between Beehive Islet and the point of Kawau Island, as a reef extends a cable South of the latter point. Immediately on passing the Beehive the water deepens to 6 fathoms, and a direct course may be shaped for Martello Rock, bearing N.W. by W., distant $1\frac{1}{2}$ mile; when within a convenient distance of the latter, pass either outside or between it and Momona Point, and enter Bon Accord Harbour.

The passage between Beehive Islet and Kaitu-kala Islands is divided by *Passage Reef*, a cluster of rocks half a cable in extent, and dry at low water, which lie nearly in the centre of it. The passage to the southward of this reef is the widest and deepest; that to the northward should not be taken unless the rocks are seen awash; the course will then be in mid-channel between them and the Beehive in 4 fathoms, and when they are past, West, until the marks are on for clearing Albert Shoal. Passage Reef bears from the North end of Kaitu-kala N. by E. $\frac{1}{2}$ E. more than half a mile, and from Beehive S. by E. $\frac{1}{2}$ E. $3\frac{1}{2}$ cables.

The passage between Kaitu-kala Islands and Passage Reef is more than half a mile wide, with 8 and 9 fathoms, and is preferable for large ships to those just described.

Albert Shoal is 2 cables in extent, and on its shoalest part has 9 ft. at low water; it lies in a direct line between Beehive Islet and the North extreme of Fish Point, and bears from Beehive Islet, W. by N. 9 cables; from Martello Rock, S. $\frac{3}{4}$ E., 9 cables; and from the South point of Bon Accord Harbour (two peaked rocks), S. by W. $\frac{1}{2}$ W., 1 mile.

A very excellent mark for clearing Albert Shoal, and one which cannot fail to be recognised, is Martello Rock in a line with a remarkable drop in the coast to the northward (the neck of Takatau peninsula), bearing a little to the

eastward of North, which will lead to the westward of the shoal nearly a quarter of a mile, and a vessel intending to pass to the westward of it must on no account haul up for Bon Accord Harbour, until Martello Rock is brought on or to the eastward of this mark.

Inner Channel.—Between *Ora Island*, which is 300 ft. high, and 2½ miles E. ¼ N. from the entrance of Maurhanghi Harbour, and Kaitu-kala Islands to the North of Ora, and the main land is the in-shore channel to Bon Accord Harbour and Kawau Bay; and for vessels coming from the southward through Wangaproa Channel, it is the easiest and most convenient, particularly with a working wind, as from the South point of Ora Island to Fish Point there is a clear working channel of 1½ mile wide, with from 7 to 9 fathoms.

MAURHANGI HARBOUR.—The next harbour southward of Bon Accord and 6 miles distant from it, is Maurhangi, on the main land. The entrance may be known by the small saddle-shaped island, *Whora*, which lies a little more than half a mile distant from it. This and Ora Island afford good protection to the harbour from easterly winds.

Whora Island lies N.W. by W. 6½ miles from the extreme of Wangaproa peninsula, and W. by S. 1¾ mile from the South end of Ora Island. Vessels bound to Maurhangi should steer to the northward of both these islands, and passing the South end of Whora, within a quarter of a mile, a course should be steered direct in between the heads.

The South head is wooded, and has a small conical islet (Kiahou) and reef lying 2½ cables North of it. The North head, *Sadler Point*, a steep green point without trees, should not be approached nearer than a cable; the clear channel between the heads is little more than half a mile in width, with from 5 to 8 fathoms water.

Strangers entering Maurhanghi Harbour are liable to mistake the arm which runs immediately North from Sadler Point for the main harbour; there is shoal water, however, in this arm, a short distance within the line of the points. The direct course up is N.W. ½ W. for the peninsula of Manga Nui, which is high, and makes as an island; it bears N.W. ½ W. from the North head, distant 1½ mile; between this peninsula and the South shore is the best anchorage for large vessels, in 7 fathoms. There is anchorage in 5 fathoms three-quarters of a mile above Manga Nui; immediately above this anchorage it shoals. Kauri forests exist near the head of the river; H.M.S. *Buffalo* procured many spars from them.

There is a narrow passage into Maurhangi Harbour from the northward between Whora Island and the main; unless when blowing directly through, it is not desirable for anything but coasters.

Southward of the harbour there is a detached rock, uncovered 6 ft. at low water, distant 4 cables from the nearest shore; from it Kiahou Islet bears N. by W. 1 mile distant, and the South extreme of Whora Island N.E. by N. ¾ N. 1¼ mile.

It is high water at Maurhangi, on full and change days, at $7^h\ 0^m$, and the tides rise from 7 to 10 feet.

To the southward of Maurhangi Harbour the coast trends S. by W. 5 miles into the bight which lies to the westward of Wangaproa peninsula. This coast, on which are some hot springs, has several rocky ledges and detached reefs lying off it, and should not be approached within half a mile.

WANGAPROA PENINSULA extends from the main land in a N.E. by E. direction for 5 miles, and is nearly separated in two places by deep bays running in on both sides. Its eastern face and Tiri Tiri Island form Wangaproa Channel.

Wanga Point, the N.E. extreme of this peninsula, has shelving tidal rocks extending off it to the N.E. one-third of a mile, which are steep-to; a *sunken rock*, with 9 ft., and 6 fathoms close to it, lies 9 cables from the shore westward of Wanga Point.

On the southern side of Wangaproa peninsula is good anchorage, in 6 fathoms, with northerly winds, in a sandy bay about a mile from the S.E. extreme; $1\frac{1}{2}$ mile farther West is another bay, off whose western extreme is a rock out of water, lying a quarter of a mile from the shore.

Tofino Bay is the western bight; here there is anchorage in 5 to 6 fathoms with northerly and westerly winds. At 3 miles to the southward of the rivers at the head of the bay is a reef of rocks extending three-quarters of a mile off the shore, dry at low water. From this reef to the North head of Auckland Harbour there are no dangers, and the coast may be safely approached within half a mile.

TIRI-TIRI ISLAND, low and covered with brushwood, lies off *Point Wangaproa* or *Hangaprava*. It is $1\frac{1}{2}$ mile long in a N.W. and S.E. direction, and bears S. by E. from the S.E. end of Kawau, $8\frac{1}{2}$ miles.

The LIGHTHOUSE on the S.E. part of Tiri-Tiri Island is an iron tower 48 ft. high, and painted of a light red colour. The light is *fixed bright*, elevated 300 ft., and may be seen 23 miles off. A sector of *red* light is shown from over Flat Rock towards Kawau Island, between N. $\frac{1}{4}$ W. and N.W. by N. $\frac{3}{4}$ N.

The island should not be passed on its eastern or outer side within 2 miles, as *Shearer Rock* with only 2 ft. on it at low water, and steep-to, lies from the East point of the island E. by N. nearly a mile distant. A *red* buoy marks the position of this rock; it is moored in 14 fathoms water N.N.E. of the rock, with the lighthouse bearing W.S.W. 1 mile distant. It is liable to be washed away; and vessels from this circumstance have struck on the rock.

Wangaproa Passage.—Should this passage be taken, it will be found perfectly safe and easy, having a clear working width of $1\frac{1}{2}$ mile, with from 9 to 15 fathoms of water. There is a rock nearly awash at low water, 3 cables W. by S. from the N.W. point of Tiri-Tiri Island, and some rocky ledges extend for a cable off the points of Wangaproa peninsula; the shores therefore

should not be approached too near on either side. There is also a reef awash 2 cables off the South side of the island, but this does not interfere with the navigation of either passage.

From a berth 1 mile eastward of Shearer Rock, 10½ miles on a S.S.W. course, or from the centre of Wangaproa Passage, the same distance on a S. ¼ E. course, will take a vessel into Rangi-toto Channel, which latter is 1¼ mile wide, and when in it the mid-channel course is S.E. 2½ miles to abreast the North head of Auckland Harbour. From Tiri-Tiri Island and generally for some miles to the northward of it, Rangi-toto and the adjacent islands eastward will be plainly seen.

RANGI-TOTO, the westernmost of a group of islands, about 10 miles South of the former island, forms the N.W. entrance to the road of Auckland. It is about 3½ miles in diameter, and rises slowly from the sea to the height of 920 ft. In its centre is a very perfect crater, about 150 ft. deep, with three nipples on its summit. The West point of the island is marked by a *beacon*. In working up towards Rangi-toto it is advisable not to stand too close to the main shore, for reefs extend for a short distance from some of the points; shoal water also extends off the West side of Rangi-toto. With southerly winds vessels may safely anchor outside.

Several rocky ledges extend off the western shores of Rangi-toto Island, which latter should not be approached in consequence within 3 cables, and the opposite shore on nearing Auckland should also be approached with caution, as an outlying sunken rock, with only 1 foot on it, at low water, lies half a mile N.W. by N. from Takapuna Head, the first point of land northward of the North head of Auckland Harbour, and distant from it three-quarters of a miles. A *black* cask buoy has been placed on the North side of this sunken rock, which is steep-to, having 3 fathoms close on all sides. From the rock the flagstaff on Mount Victoria bears S. ¼ E.; the buoy on Rough Rock S.E. by E. ¾ E.; and Rangi-toto Peak N.E. ½ E.

A pinnacle rock, with 4 ft. over it, was found in 1876 near the reef which skirts the West side of Rangi-toto Island. A *black buoy* was placed westward of it in 3½ fathoms, with Bean Rock lighthouse (or the *green* light) bearing S.S.E.; the northern cone of Rangi-toto N.E. by E. ½ E., and the beacon on Rangi-toto Reef N. by W. ¾ W. Vessels are cautioned not to pass eastward of the buoy.

AUCKLAND HARBOUR.—The North head of this harbour, and Mount Victoria, half a mile further to the westward, are two remarkable round hills, easily distinguished at a distance of 6 or 8 miles. Mount Victoria is 280 ft. high, and has a signal and pilot station on its summit. The signals are described on page 349.

Rough Rock, on the western side of Rangi-toto Channel, with 8 ft. at low water, lies N. by E. three-quarters of a mile from the North head of Auckland

Harbour, and has a *chequered red and white buoy* on its shoal part; it may be passed on either side, but to the eastward is preferable.

A rocky patch, about one-third of a cable in extent, having only 8 ft. on it at low water springs, with 2½ and 3 fathoms on its edges, lies between Takapona Head and Rough Rock, and a *red buoy* has been placed on the East side of the patch in 2½ fathoms at low water springs, with Takapona Head bearing W.S.W., 2¾ cables; Rough Rock East 3¼ cables; and the extreme of North Head S. by E. ½ E. 6½ cables.

In consequence of another sand-bank having grown up to the southward of Rough Rock, about half a cable long, with only 12 ft. water on it, at low water spring tides, a *striped red* and *black buoy* has been placed on its south-eastern edge, in 3 fathoms at low water. This buoy is distant 2½ cables S.E. by S. ¾ S. from Rough Rock buoy, and from it Mount Eden is just open of North Head S.W. by S. ¾ S.; and Takapona Head bears W. by N. ½ N., distant 7¼ cables.

Masters of vessels in entering Auckland Harbour are cautioned not to approach too near the western shore of Rangi-toto Channel, as rocky ledges and foul ground extend from 2 to 3 cables from the shore. Neither is it prudent for large vessels to take the channel westward of Rough Rock, although it is now well marked by the addition of the buoys above mentioned. Vessels passing in-shore of Rough Rock should not approach the buoy within 1 cable, as foul ground extends some distance around the rock.

The NORTH HEAD should not be approached nearer than a quarter of a mile, as a sandy spit extends off it. On opening out the town of Auckland, which stands on the South shore of the harbour, 2 miles from the entrance, the water deepens to 8 and 9 fathoms, and the channel, which lies in a W. by S. direction, maintains an average breadth of three-quarters of a mile.

A *red buoy* is placed in 4½ fathoms on the end of a flat which extends off Depôt Point on the North shore, three-quarters of a mile above the North Head; a white storehouse is built on this point; Britomart Point S.W. by W. ¼ W. will clear this spit, and lead up the harbour. The reef, which dries, extending from Depôt Point is marked by a pole *beacon*.

A *red buoy* is moored in 3¾ fathoms at three-quarters of a cable N.E. ½ E. from the N.E. extreme of the Railway Pier, and another in 4 fathoms at the same distance N.W. ¼ N. from the N.W. extreme.

The South shore of the harbour is flat, and mud flats and rocky patches dry at some distance off; this shore should not be approached within a third of a mile; or in beating up, tack at the first shoal cast.

LIGHTS.—Two *fixed bright* lights, horizontal, are (or were) exhibited from the western extremity of the Commercial Wharf; these lights, together with the three *fixed bright* lights shown triangularly, situated on the eastern extremity of the same wharf, are elevated 29 ft. above high water, and in clear weather are visible from a distance of 6 miles. The triangular lights and

horizontal lights in line will lead clear of the shoal water on the South side of Auckland Harbour. The triangular lights appear as one at 3 miles distance, and are not easily distinguished from the lights of the town point.

Two *fixed red* lights, vertical, are shown from a post on the N.E. angle of the Railway Wharf at Britomart Point, and a *fixed bright* light on its western extreme.

BEAN ROCKS LIGHT.—Bean Rocks, which uncover at low water, bear E. by S. from North Head nearly 1 mile distant; on them, at an elevation of 50 ft. above high water, a *fixed* light is exhibited, showing *red* when bearing between W. $\frac{1}{2}$ S. and S.W. by W. $\frac{3}{4}$ W. in Tehmaki Strait, and on the South side of Koreho Channel, including the reef North of Koreho Island; *bright* between S.W. by W. $\frac{3}{4}$ W. and S.W. $\frac{1}{4}$ W. in the fairway of Koreho Channel, and the S.E. side of Hieh Channel; *green* between S.W. $\frac{1}{4}$ W. and S.E. by S. $\frac{1}{2}$ S. on the N.W. side of Koreho and Hieh Channels, including the East side of Rangi-toto Channel and Rangi-toto Reef; *bright* between S.E. by S. $\frac{1}{2}$ S. and S.E. $\frac{3}{4}$ S. in the fairway of Rangi-toto Channel; *red* between S.E. $\frac{3}{4}$ S. and E. by N. $\frac{3}{4}$ N. on the West side of Rangi-toto Channel, including Rough Rock and the North shore of the harbour, with the Sandspit buoy and Depôt Point; and *bright* when bearing between E. by N. $\frac{3}{4}$ N. and N.E. $\frac{1}{2}$ E. in the fairway of the harbour. In-shore the light is eclipsed between the bearings N.E. $\frac{1}{2}$ E. round by North to W. $\frac{1}{2}$ S. The light is shown from an iron framework, which is not conspicuous.

Directions at Night.—Vessels entering Auckland Harbour by the North or Rangi-toto Channel, should make the bright or fairway light, steering in on this line of light until the summit of the North Head bears S.W.; then keep away South across the *red* into the bright (harbour) fairway light, bringing the three bright lights (in a triangle) on Queen Street wharf to bear S.W. by W. $\frac{3}{4}$ W., which will lead up the harbour to the usual anchorage ground below the wharf. These lights in line with the two lights clear the shoal ground on the South side of the harbour as above described.

Vessels having to work in should not enter on the *green* light when near Rangi-toto Reef, that is, when the Peak of Rangi-toto bears E. $\frac{1}{4}$ N.; nor on the *red* when the summit of Mount Victoria bears S.W. $\frac{1}{4}$ W., as they will on this latter bearing be in the vicinity of Rough Rock; they must also keep well in the bright light when passing the Sandspit buoy and Depôt Point.

Vessels entering by Tehmaki Strait will see the *red* light over the low southern part of Koreho Island, and taking care not to approach within 1 mile of the island, pass through the *red* into the bright fairway light of Koreho Channel; then steer so as to pass about 2 cables N.W. of the lighthouse, crossing the coloured lights of Rangi-toto Channel, into the bright harbour fairway light, and for the anchorage as before described.

Vessels entering by Hieh Channel will keep on the line (S.W. $\frac{1}{4}$ W.) intersecting the *green* and bright lights, edging away into the bright in passing the

N.W. extreme of Hieh Island, and thence up Koreho Channel and into the harbour as before described.

The Beacon that formerly stood on Bean Rocks is now erected on the N.E. extreme of Bastion Reef, and from it the lighthouse bears N.W. distant 3 cables.

Anchorage.—Merchant shipping are generally berthed by the pilot opposite Commercial Bay: men-of-war should berth East of Britomart Point, bringing Stanley and Onepolo Points in one, and Britomart Point S.W. ½ W., in 5 to 6 fathoms, mud.

Opposite the town the harbour has a depth of from 7 to 9 fathoms, breadth across 1½ mile, and 6 miles farther up the harbour there is a depth of 4 fathoms. The commercial wharf forming a continuation of Queen Street (the principal thoroughfare of the town) is more than 1,500 ft. long, where the largest merchant vessels and the San Francisco, Honolulu, Australian, and New Zealand mail steamers may lie alongside in deep water.

It is high water, on full and change, in Auckland Harbour at $7^h\ 5^m$; springs rise 11 ft., neaps 9 ft. The velocity at springs seldom exceeds 2 knots.

WAITEMATA RIVER continues its westerly direction 3 miles from the town of Auckland, opening into an extensive shallow basin, and is navigable for ships of large tonnage; one arm then branches off to the northward towards Kaipara River, and another to the southward towards Manukau Harbour. The northern arm has a deep but narrow channel, and is navigable for 2½ miles, or as far as Herald Island. The passage leading to Manukau is available only for large boats, and its head is separated from the waters of that harbour by a portage of about 1½ mile. From Riverhead settlement a railway is constructed across the island to Helensville at the South end of Kaipara Harbour.

Near the middle of the basin, and at the part where the channels branch off, is a rock called *Boat Rock*, which at a little distance exactly resembles a boat; it is 15 ft. long, and nearly even with the surface at high water, and is usually covered with cormorants. On the South side of the gorge, in the narrowest part, opening into the basin, are the remains of a small island about 30 ft. high, having bushes on the top, called the *Sentinel;* it is composed of a sort of soft sandstone and clay, off which there is very good fishing with hook and line. It is about 2 miles from Britomart Point, the river here being about three-quarters of a mile wide.

The *North Head* and *Mount Victoria*, like the greater part of this country where it is not forest land, are covered with fern. From these hills the land continues of a regular form, and of moderate height, for some distance round the North side of the harbour, bare of trees, and having a cliff of light brown sandstone, the strata horizontal and well defined. The *South Head* is lower than the North; it is a precipice, and is of the same formation as the rest. This harbour is broken into numerous bays, and the surface of the land undulates in moderate hills and slopes; in one of these bays, upon the South side,

about half-way between the South Head and Sentinel Rock, is the town of Auckland; it is called *Commercial Bay*, and is separated from Official Bay by *Britomart Point*, upon which are the barracks and South of that the church is built. A railway wharf extends $1\frac{3}{4}$ cable in a northerly direction from Britomart Point.

AUCKLAND, once the largest city of New Zealand, was first established in 1840. The number of European inhabitants in the town, by the census of 1881, was 6,664, and including the suburbs 37,777. The principal streets, all lighted with gas, are built with continuous ranges of fine buildings. The manufacturing industries are numerous, such as ship and boat building, engineering and iron foundries, the manufacture of glass, rope, twine, tiles, earthenware, &c., &c.

There are numerous wharves and jetties, with facilities for loading and discharging vessels; also a *graving dock*, 300 ft. long, 42 ft. wide, and with 14 to 15 ft. on the sill at high water, spring tides. Another dock, to accommodate the largest vessels afloat, is under construction at Point Calliope, on the North side of the harbour. Telegraphic communication exists with all the chief places in both islands, and a railway connects Auckland with Helensville at the South end of Kaipara Harbour, and another with Onehunga on Manukau Harbour, whence it continues to the southward inland to the Waikato district. In 1881, 218 vessels visited Auckland, with a total tonnage of 127,767. The value of the exports in 1880 amounted to £758,271.

Several *Collieries* are in connection with Auckland by railway; large quantities of coal, of excellent quality, are raised and sent to Auckland for the use of steamers. One company is working a seam 54 ft. thick.

At the back of the town stands *Mount Eden*, the family name of the Earl of Auckland. This mountain, with others in its neighbourhood, is of volcanic origin, as is the Island of Rangitoto, and probably the whole country. These hills were formerly fortified places, and are nearly all encircled near the summit with a succession of trenches, many of great depth, giving the appearance of terraces, as many as five or six, one below the other. Mount Crater has a large deep crater in its centre, and is very remarkable as a native fortification. The hills rise abruptly from the plain, are steep, and of considerable height; are well formed for strongholds and places of defence in a country filled with warlike tribes. Masses and blocks of scoria of immense size cover the ground near these mountains, and are excellent for building.

A mile to the eastward of Auckland there is a small bay called *Hobson's Bay*, or *Oraki;* it has a narrow entrance, and forms almost a natural dock, and could easily be converted into one by means of natural sluices. To this place the few natives who formed the remnant of the once large tribe of the Nga-te-whatua, of Waitemata, had returned from Manukau in 1842.

At $3\frac{3}{4}$ miles further to the eastward, and southward of Koreho, another inlet, commonly called the *Tehmaki*, leads towards Manukau; and here is the

shortest portage into the latter harbour, it being only a quarter of a mile across. At the entrance into this channel is a bar, with 3 to 6 ft. depth at low water, but inside the channel deepens; vessels of 200 tons have gone up for some distance, and large barges can go to the portage. The land on both sides of the Tehmaki is excellent. A great deal of lignite is found on the Tehmaki, but no wood, with the exception of jungle. At 11 miles eastward of the Tehmaki is the entrance of *Wairoa River*, which has only a foot of water at low water in its entrance, which is marked by a beacon.

Should it be necessary to wait for daylight, or any other cause, to enter Auckland Harbour, anchorage with southerly or westerly winds may be obtained in the bight North of Wangaproa Peninsula, in from 12 to 16 fathoms, or if advanced to the southward of that peninsula, anywhere between it and Rangitoto Island, in from 8 to 10 fathoms. When sufficiently far South to be protected by the Islands of Rangitoto, Motu Tapu, &c., safe anchorage in 6 and 7 fathoms may be had in almost any weather; and strangers are recommended to adopt this course rather than to attempt to enter the harbour at night, unless the light on Bean Rocks, or the Rangitoto shore and the North Head of Auckland are plainly made out.

From AUCKLAND to the N.E.—Vessels bound to the northward from Auckland will find Rangitoto Channel the safest and easiest, as well as the most direct, and the directions already given will be found sufficient. This channel is also recommended to vessels bound to the eastward, and intending to pass out of Hauraki Gulf between Great Barrier Island and Cape Colville, for this reason, that after passing Rangitoto Island, one course, N.E. by N. $\frac{1}{4}$ N., leads clear of everything, and direct for that passage, passing to the westward of the islands of Otatou at a distance of 2 miles, and thereby avoiding David Rocks, an extensive cluster occupying a space of 2 miles, and lying a mile to the eastward of the easternmost Otatou Island, and likewise D'Urville Rocks, which are 3 miles to the eastward of David Rocks.

From the westernmost Otatou Island to Cape Colville is N.E. $\frac{1}{4}$ N. 22 miles; and from a berth 2 miles off that island, 24 miles on a N.E. by N. $\frac{1}{4}$ N. course will carry a vessel abreast, and to the northward of Channel Islet (Takaupo), a high, steep rock lying N.N.W., 3 miles from Cape Colville. After passing Channel Islet, which may be done on either side, though to the northward is preferable, as there is frequently a heavy swell setting on Cape Colville, a ship bound to the southward should edge away E. $\frac{1}{2}$ S., passing between *Cuvier Island* and the *D'Haussez Group* (of D'Urville, 1827).

The passage between Cape Colville and the South end of Great Barrier Island is $7\frac{3}{4}$ miles in width in its narrowest part.

KOREHO and HIEH CHANNELS are to the northward of Auckland, and the former, which leads into Hieh and Waiheki Channels, lies between Rangitoto Island and the mainland. With a N.W. wind, which blows directly through Rangitoto Passage, it may be sometimes convenient to pass to sea

through Hieh Channel, which lies between the island of the same name and that of Motu Tapu; it is three-quarters of a mile in width, and has from 8 to 15 fathoms depth of water.

Leaving Auckland Harbour, and passing between its North Head and Bean Rocks, when in mid-channel between the two, steer N.N.E., or for the peak of Rangitoto Island for about half a mile, or until the marks are on for clearing a shoal of 9 ft., at low water, which lies in the centre of Koreho Channel: these marks are, the flag-staff on Mount Victoria in a line with the South end of the white sandy beach immediately to the northward of the North Head of Auckland. Keeping these marks on will carry a vessel to the southward of the shoal in 3 fathoms at low water. This shoal, which is chiefly mud, is 2 cables in extent; from it, the central peak of Rangitoto Island bears North 1¾ mile; North Head of Auckland, S.W. by W. ¼ W. 2 miles; Bean Rocks lighthouse, S.W. by S., 14 cables.

When the Peak of Rangitoto Island bears N.N.W., a course may be steered N.E. ½ E. for Hieh Channel, passing the small island Koreho at the distance of little more than half a mile. On the North extreme of a reef which lies off the East end of Koreho Island is a *beacon*, and on the port hand, about 3 cables from the Rangitoto shore, is a patch of 5 ft., with a *red* and *white buoy* on it.

In passing through Hieh Channel, neither the N.W. head of Hieh Island, nor the S.E. point of Motu Tapu should be approached within 2 cables, as there are some rocks lying off both.

When Hieh Island is passed, the channel between Motu Tapu and Waiheki Island increases to a width of 2 miles, with deep water all over, and a N.E. by N. course for 7 miles will take a vessel mid-channel between David and D'Urville Rocks, at a distance of 1¼ mile from either (David Rocks are well above water. D'Urville Rocks are covered 3 ft. at high water.) There are no other dangers between, and they may be passed much closer if necessary. When clear of them, haul up N.N.E., or with a N.W. wind as high as a vessel will lie for Cape Colville Passage.

TEHMAKI STRAIT and WAIHEKI CHANNEL.—The latter channel, which lies between the Islands Waiheki and Ponoui, is convenient for vessels bound to Coromandel Harbour, or the River Thames, from Auckland; and small vessels working up for Auckland from the eastward will have the advantage of smooth water and anchorage in Tehmaki Strait, by using it.

From the North Head of Auckland Harbour, through Koreho Channel and Tehmaki Strait to Passage Rock in the western entrance of Waiheki Channel, is 15½ miles. *Tehmaki Strait*, the Astrolabe Channel of D'Urville, which is formed by Waiheki Island on the North and the mainland on the South side, has excellent anchorage in every part, in from 4 to 6 fathoms, muddy bottom. The only deviation from these uniform soundings is a shell bank, nearly in mid-channel, with 3 fathoms at low water, bearing from the North point of

Clarke Island (Motu Karaka) N.E. ½ E. 3¼ miles, and from Maraitai Point on the mainland N. by W. 1¼ mile.

After having cleared the 9-ft. shoal in Koreho Passage, as before directed, and passed the Island of Koreho on its North side at half a mile distance, keep to the southward of Hieh Island, and when about the same distance from it, steer E. ¼ N. for Passage Rock, which will then be 9 miles distant.

Passage and Sunday Rocks.—The former is 40 ft. high, and may be passed close on either side. In a direct line between it and the northern or outer extreme of Ponoui Head, nearly 1¼ mile from each, lies Sunday Rock, with 8 feet at low water, and marked with a *black buoy*. It bears from the South point of Waiheki, E. by N. ¾ N. 9 cables; and from Thames Point (West point of Ponoui), N. by W. ¼ W. 7½ cables. There is 9 and 10 fathoms in the channel on either side of Sunday Rock.

If Passage Rock is passed on the North side, the shore of Waiheki Island should be kept on board within 2 cables' lengths for 1½ mile after passing it (keeping Ponoui Head on the starboard bow), until the bay South of Finger Point is opened out; a vessel will then be well clear of Sunday Rock.

If Passage Rock is passed on the South side, a course should be steered for the point next South of Ponoui Head for 1½ mile, or until Thames Point bears S. by W. ½ W.; the channel becomes then three-quarters of a mile wide, with from 6 to 12 fathoms water in it. Ponoui Head should not be approached within a cable's length, as some rocks lie off it.

Between Kauri Point (the N.E. point of Waiheki Island) and the island of Ponoui, lie the small islands of Pakatoa and Rotaro in a North and South direction, and forming a continuation of the eastern side of the channel. To the northward of the former, and between it and Waiheki, is the fair channel out, which is a little more than half a mile in width, and with a depth of 9 fathoms. The North point of Pakatoa has a reef of rocks extending nearly 2 cables off it to the northward.

Single Rock (above water), in the channel, lies little more than half a mile S.W. by W. from the South point of Pakatoa, and has deep water close-to. It is three-quarters of a mile from the Waiheki shore; and in a line midway between it and the same point is also a sunken rock, but vessels have no occasion to pass to the eastward of Single Rock; coasters sometimes take the channel, 1½ cable wide, between Pakatoa and Rotaro. There is also a channel South of the latter island of the same width; and if used, the round South head of the island should be kept pretty close on board. At half a mile W. ¾ S. of this head, is a cluster of rocks awash, a cable in extent. Vessels taking this narrow channel should pass to the southward of them.

Opopo Bay, at the East end of Waiheki Island, is a favourite watering place. A vessel may anchor as near as convenient to the stream.

Terakihi Islet.—In passing out of Waiheki Channel, this bare rocky islet

will be seen, 1½ mile eastward from Pakatoa; there are no dangers near; it is generally covered with cormorants.

When clear of Waiheki Channel, and abreast Terakihi, a N. ¾ W. course 23 miles will take a vessel to the westward of Channel Islet (Takaupo), and between Cape Colville and Great Barrier Island.

Ponoui Islet, 4 miles long North and South, forms the South side of Waiheki Strait. Its South extreme is separated from *Pahiki Island* by a strait one mile wide and having 9 ft. water through it. This strait is blocked up in three parts of its width by *Pauhenehe Spit*, which extends eastward from the East end of Pahiki Island.

Light.—On the outer extreme of Pauhenehe Spit is a white open frame structure, supporting the keeper's dwelling, above which is a lantern which shows a *fixed bright* light, elevated 50 ft. above high water, and visible about 9 miles; it is obscured over Pahiki Island.

Tides.—On the eastern coast of the North Island the flood stream runs to the northward, and the ebb to the southward, at the rate of about 1 knot; but in Hauraki Gulf they take a contrary direction, the flood running South and the ebb North. The body of the flood stream, entering from the southward between Cape Barrier and Cape Colville, separates about False Head, on the West side of Great Barrier Island, and sweeps round to the southward, filling the Thames and Waitemata Rivers through the different channels leading to Auckland. The ebb tide runs from 1 to 1½ knot to the S.E. between Great Barrier Island and Cape Colville. The range of tide in Hauraki Gulf is from 4 to 10 ft.

In Wangaproa Channel the tides run from 1 to 2 knots; in Waiheki Strait, half a knot; but from 2 to 3 knots in the adjoining narrow channels.

CAPE COLVILLE, or Moe Hao, is the North extremity of the peninsula which separates the Frith of the Thames from the ocean. It was named by Cook after the nobleman. He says it rises directly from the sea to a considerable height, and is remarkable for a lofty rock, which stands on the pitch of the point, and may be distinguished at a very great distance. These mountains rise in two distinct peaks to a height of 2,842 ft. There is a dangerous reef of rocks running nearly three-quarters of a mile northward of the cape. Throughout its length runs a chain of wooded hills, 2,000 ft. high, with a sharp crest and steep declivitous sides, which are washed by the sea both on the eastern and western coasts; but on the latter the rocky line is interrupted by an inlet, which forms Waihau, or Coromandel Harbour; at the back of the harbour the hills rise into remarkable pinnacled and pyramidical summits, one of which is called the Castle.

COROMANDEL HARBOUR* (*Waihau*) is 20 miles S.S.E. of Cape Colville,

* Coromandel is a thriving gold-mining district, with a population of 6,202, in 1881.

and 14 miles E.N.E. from the eastern entrance of Waiheki Channel. Its position is well marked by a remarkable hill with a square rocky crest, Castle Hill, which lies 3 miles eastward of the head of the harbour, and may be seen for many miles, attaining an elevation of about 1,600 ft. The entrance will also be easily known by the small round islet Tuhuia lying 1¼ mile immediately West of it; a smaller rock lies a quarter of a mile South of Tuhuia. There are likewise three islands to the N.W. of the North head, each from half a mile to a mile in extent, the extreme island being more than 3 miles distant. In entering, a vessel may pass on either side of Tuhuia, in deep water.

Coromandel Harbour is formed on the North side by the peninsula of Waihou, which is joined to the main by a narrow sandy neck, and on the South side by the main land. The harbour runs N.E. and S.W., is a mile wide at the entrance, and carries a depth exceeding 5 fathoms for 1½ mile inside. The best anchorage is immediately round the S.E. point of the peninsula of Waihou, about 3 cables off shore, in 4 fathoms. At a quarter of a mile above this anchorage the water shoals to 14 ft., and the large expanse of water at the head of the harbour has a depth of a little more than 1 fathom. There is also a shoal patch of 4 ft., 3 cables above the anchorage; it bears from the S.E. point of Waihou Peninsula N.E. three-quarters of a mile, and from the sandy neck S.E. by E. the same distance; vessels in taking up an anchorage should not open out this sandy neck, they are then certain to be clear of the shoal patch, and in not less than 3 fathoms.

The three islands which lie immediately N.W. of Coromandel Harbour are Huieh, Waimata, and Hoki. *Huieh*, the northernmost, is high and cliffy on its northern and western sides, terminating in a low shingle point to the eastward, and is half a mile in extent; a small islet lies off this low point, another off its western point, and a rock above water a quarter of a mile off its South side. *Waimata*, the middle island, a mile in length North and South, is a double island, connected at low water by a sandy neck; the northern portion is called Ko-puki. At 3 cables N.W. by W. from the N.W. cliffy head of Waimata is a reef of rocks covered at high water. *Hoki*, the southernmost and the smallest island, is half a mile long, having a passage of nearly the same width between it and Waimata, with 14 fathoms water. A sunken rock lies half a cable off the southern end of the latter island. There is a passage for vessels between Hoki and the shore with 6 fathoms.

At 2 miles northward of this group is another chain of islands, extending along the coast to the N.W. for 4 miles.

Two small harbours lie immediately South of Coromandel Harbour: the first, *Tekomi*, is 3 cables wide at its entrance, and is well sheltered by the *Island of*

There are several townships, of which the most important are Kapanga, Tokatea, and Driving Creek. The former is situated on Coromandel Harbour, 37 miles North of Grahamstown.

Rangipuka, lying close off its entrance, and may be passed on either side. The anchorage, in 4 fathoms, is half a mile within the heads of the harbour, or it is stated in 2½ fathoms one-third of a mile from the entrance.

Menia Bay, a mile South of Tekomi, is not so good an anchorage; the two islands, Wekarua, extend half a mile to the westward off its northern head, and there is anchorage in 3½ fathoms, three-quarters of a mile inside their outer extreme. This bay is open to westerly winds.

Deadman Point is the southern entrance point of Menia Bay, and from thence to the mouth of Thames River, nearly 20 miles distant, the coast line is straight.

RIVER THAMES.—From Coromandel Harbour to the mouth of the Thames (*Waihao*) the coast is rocky, and there is no communication between the harbour and the valley of the Thames by land. Not far from the entrance to the Thames is a station of the Church Missionary Society, occupying a most picturesque position on the slope of the eastern mountains, which are crowned by a forest of lofty trees. An arm of the sea, which is joined by a creek, the *Wawakaurunga*, bathes the foot of the hills where the buildings are placed. A fertile alluvial flat spreads along its left shore, on which stands a large native fortification, *Kaueranga*, which often contained nearly 2,000 inhabitants.

There is no harbour, properly speaking, in the Waihao, or Frith of the Thames, and large vessels cannot approach, as a mud-bank stretches out 3½ miles between the Thames and the *Piako*, a river entering the estuary to the West of it, having their embouchures close to each other. There is, however, a channel into the Thames with a minimum depth of 5 ft. at dead low water; higher up the depth of the water is 2 fathoms. Some vessels have gone up the river nearly 50 miles, and large boats can ascend about 90 miles. A channel also leads into the Piako, but this river is the smaller of the two, and at low water admits boats only. Two conspicuous white telegraph towers stand at the entrance to Piako River, and can be seen from a distance of 9 miles. There is anchorage in 4 fathoms, with these towers open of each other, bearing S.E., and Mount Two Peaks N.E. by N.

Grahamstown, the emporium of the Thames Gold Fields, is situated on the eastern shores of the Frith of Thames, 5 miles northward of the mouth of the river; it contained a population of 4,863 in 1881. There is wharfage accommodation, also a long pier, alongside which the coasting steamers lie. *Shortland* township is a short distance southward of Grahamstown.

Vessels from Auckland bound for *Kaueranga Creek*, at Thames River entrance, should steer to pass 2 miles North of Oreri Point, and from thence to Pararu Point, a distance of 16 miles.

Lights.—A *fixed green* light, 18 ft. above high water, is shown on the outer end of Grahamstown wharf, visible 2 miles, and a *fixed bright* light is shown on the East side of Kaueranga Channel.

Channel Islet, or *Motu Takupo*, is a conical rock, 720 ft. high, $2\frac{3}{4}$ miles N.W. by N. $\frac{3}{4}$ N. of Cape Colville. It is steep close-to.

The seaward face of the Gulf of Hauraki is protected by a range of large islands lying North and N.W. of Cape Colville. We have before alluded to those off Cape Tewara, the N.W. point, as being named the Hen and Chickens by Cook.

GREAT BARRIER ISLAND of Cook, or *Otea*, is the southernmost of these islands. It is hilly, and very much intersected in its conformation. It is about 21 miles in length N.N.W. and S.S.E., and 10 miles in its greatest breadth. Some islets are scattered along its western side. Its North point was called *Aiguilles* (Needles) *Point* by D'Urville. From the West the North point of Otea appears terminated by a peninsula, bare of verdure, of a brownish colour, the sea-beaten flanks of which had an imposing appearance. Besides this, it is accompanied by some peaked rocks, which assume the most fantastic forms, and some of which are very much broken. From this circumstance he applied the name to the cape.

The island is in parts thickly wooded. The kauri tree flourished at one time in great abundance on the high land; all within convenient reach, however, has been cut down and exported, or used for ship-building purposes. Small vessels are built and repaired at Port Abercrombie. In 1848 a vessel of 400 tons was built and equipped there, and carried away a cargo of copper ore from the mine which was then being worked at the northern end of the island.

A range of mountains of considerable elevation extends through its whole length, almost without interruption. *Mount Hobson*, the highest, is clothed with trees to its summit, and rises to a peak from the central part of the island to a height of 2,130 ft.

Horn Rock lies nearly mid-channel, between Great and Little Barrier Islands, bearing from the S.E. end of the latter, E.S.E., 4 miles; from False Head of Great Barrier Island, S.W., 5 miles; and from Pirogues Rocks, W. $\frac{1}{4}$ S., 7 miles; there is 12 and 13 fathoms close to it, and from 25 to 30 fathoms in the passages on either side. It breaks when there is any swell.

On the western side of Great Barrier Island are several bays and harbours, for the most part open to westerly and S.W. winds, but affording excellent shelter from easterly winds. They are, commencing from the northward, Catherine Bay, Ports Abercrombie and FitzRoy, Wangapara-para Harbour, Okupu Bay, and Port Tofiño.

From Needles Point, the northern extreme of the island, the western coast trends S.W. by S., $5\frac{1}{2}$ miles, to *Miner's Head*, the North point of Catherine Bay. The summit over this head is a conical hill, resembling a beehive, and is a productive copper mine. There is a small cove immediately South of Miner's Head, where coasters anchor in fine weather, and ship the ore; a rock awash at high water lies in the centre of it.

Catherine Bay.—The South head of this bay is nearly 3 miles S. by W.

from Miner's Head, and has a remarkable pillar rock standing off it. The bay runs to the eastward for 2½ miles, narrows very rapidly, and terminates in two sandy coves. On the North side of the bay, a quarter of a mile from the shore, is a large flat rock, always awash, nearly a mile to the N.W. of the peninsula extreme at the head of the bay, with good anchorage half a mile to the S.E. of it, in 6 and 7 fathoms.

Port Abercrombie is 1½ mile South of Catherine Bay. Selwyn Island, 2 miles in length East and West, lies in the entrance, and, from seaward, would be taken for a part of the main. The entrance to Port Abercrombie is 1¼ mile broad, and there is 30 fathoms water across; it is entirely open to westerly winds, and the general depth of water is too great for convenient anchorage, ranging from 14 to 20 fathoms, except in Nagle Cove.

Nagle Cove is a small but secure anchorage immediately round the North head, where several coasters might lie in safety, and with room for two vessels of the size of sloops of war, when moored; a small islet lies in the centre of it. The depth of water in this cove is from 7 to 9 fathoms, and here was the ship-building establishment. Fresh water and fuel may be obtained without difficulty, and also numerous wild goats in the neighbourhood.

Port FitzRoy is the inner harbour of Port Abercrombie. It is an extensive sheet of water, well sheltered from all winds. Its entrance, which is 2 cables in width, with a depth of more than 20 fathoms in it, bears E.S.E. 1½ mile from the North entrance point of the latter port.

False or *Bald Head* bears S. by E. ¼ E., 3¼ miles from Wellington Head, the South entrance point of Port Abercrombie, and much resembles it in its remarkable appearance and character, False Head being also the westernmost of a group of islands which lie off the main island, leaving a passage between, a quarter of a mile wide in the narrowest part.

Wangapara-para Harbour lies 6 miles S.E. of Bald Head, and a little more than a mile to the eastward of *Cliff Island*, running in a N.N.W. direction 1 mile, with a width of 3 cables. This is a snug little anchorage with all winds, except those between S.S.E. and S.W. The *Pirogues*, three bare flat-topped rocks high above water, resembling boats under sail, and covering the space of a cable's length, lie off this part of the coast, and may be seen for several miles. *Okupu Bay*, 1 mile south-eastward of Wangapara-para Harbour, is a mile wide at the entrance, and is entirely open to winds ranging from South to West.

Port Tofino is the southern harbour, and bears S.S.E., 2½ miles from Okupu Bay. Close off the North head is a high peaked islet, and immediately over the head a remarkable conical peak. The North and South heads lie W.N.W. and E.S.E. from each other 2 miles apart. From easterly or S.E. gales, a cove in the S.E. corner of the bay affords excellent shelter in 4 and 5 fathoms, mud bottom. This cove is immediately to the westward of a high rocky peninsula

point on the South side of the harbour, and small vessels might anchor far enough in to be sheltered from S.W. winds.

Port Tofiño is a favourite anchorage with the coasters. South of the southern head of Port Tofiño, half a mile distant, is a rock which does not always break, and between it and the shore another sunken one.

Cape Barrier, the S.E. extreme of the island, is 2½ miles E. by S. from the South point of Tofiño Harbour. Rocks extend a cable off Cape Barrier; and two rocks, detached and breaking, lie 3 cables to the eastward of it. Vessels rounding this cape are recommended to give it a berth of 2 miles.

The East Coast is destitute of harbours, and, unless after westerly winds, there is generally a heavy swell setting on it. At 2 miles North of the eastern cape is *Arid Island*, a bold cliffy island, with landing on its western side in fine weather; it is 1½ mile long North and South. Off its eastern side, and extending to the East cape, are four small conical islets, all steep-to.

It is high water, on full and change, in Port Abercrombie, at $6^h\ 25^m$, rise from 7 to 10 ft. There is very little tide felt on the outside of Great Barrier Island; the flood tide runs to the northward.

LITTLE BARRIER ISLAND (*Houtourou*), 9 miles West of the Great Island, is very remarkable. It is 4 miles in length North and South, and 3¼ miles East and West, steep, and almost inaccessible. It rises 2,400 ft. above the sea, and has on its summit several distinct peaks of nearly the same elevation; hence it has received the name of Mount Manypeaks. A low and remarkable stone boulder point, steep close-to, forms the S.W. extreme.

MOKO-HINOU ISLANDS.—These islands are 15 miles N.W. of Great Barrier, and 15 miles to the eastward of Moro Tiri Islands. They consist of three islands, about 250 ft. high; the two principal islands lie close together, and are each nearly a mile in extent, in a N.E. and S.W. direction. They bear from the southernmost Poor Knight S.E. ½ E. 29 miles, and from the East Chicken E. ¾ N. 14¾ miles. There are no dangers about these islands but what are visible.

LIGHTHOUSE.—On *Burgess Islet*, one of Moko-Hinou Islands, is a white lighthouse, 46 ft. high, showing a *flashing bright* light, with a flash every 10 seconds, elevated 385 ft., and visible 26 miles in clear weather. The light was first exhibited June 18th, 1883.

Fanal Island is E. by S. ½ S., 2 miles distant from the S.W. Moko-Hinou; it is little more than half a mile in length, and N. by E. of it, three-quarters of a mile distant, lies a long reef, half a mile in extent East and West, and always above high water. Navire Rock lies S. by W. ¾ W., three-quarters of a mile from the S.W. point of Fanal, and Simpson Rock S. ½ W. 2¾ miles. These two rocks are well out of the water, and the latter may be seen at 3 miles distance.

Cape Barrier, the S.E. extreme of Great Barrier Island, bears from Cape Col-

ville N.E. by N. 12½ miles, and between these two capes is the eastern approach to Hauraki Gulf.

CUVIER ISLAND, which bears from Cape Colville E.N.E. 20 miles, is 2 miles long in an East and West direction, and rises to a rather remarkable peak. It is visible at a considerable distance, and serves as a finger-post to the channel leading to Hauraki Gulf.

The Coast.—From Cape Colville the land trends E. by N. ½ N. 3 miles to a similar rocky headland, W.N.W. from which, three-quarters of a mile distant, is a rocky islet similar in feature to Channel Islet. The coast then runs to the south-eastward, nearly 4 miles to *Charles Cove*, exposed, and not desirable even for coasters. Half a mile to the N.W. of the eastern head of Charles Cove is a small islet, and the coast continues its south-easterly trend 4 miles farther to a cliffy point. At 3 miles S.S.E. of this is *Waikawau Bay* and *River*, both unimportant and unsheltered.

KENNEDY BAY (*Aratuhu*) is distant 4 miles from Waikawau. Its entrance, which is half a mile wide, bears from the N.W. end of Great Mercury Island S.W. ¼ W. 9 miles. It affords fair anchorage for small vessels in 4 and 5 fathoms, with westerly winds round from North to South. At three-quarters of a mile N.E. ½ N. from the outer S.E. cliffy point of this bay is a rock awash. South-eastward of Kennedy Bay are two sandy beaches, each about a mile in extent. Round the cliffy South head of the southern beach is *Wangapoa River*, fit for coasters, having 5 ft. water on its bar at low water.

From Wangapoa River the coast trends E.N.E. 8 miles to Tepaki Point, which latter is nearly 4 miles to the north-westward of the North entrance point of Mercury Bay. Off this point lie Mercury Islands.

MERCURY or D'Haussez Islands.—This group consists of four principal, with several smaller islands, as also low reefs and rocks interspersed among them; they occupy a space of 10 miles North and South, and the same distance East and West.

Great Mercury Island (*Ahou Ahou*) is the largest, being 4 miles long North and South, and nearly 3 miles broad at its southern part. It is steep, and cliffy on the northern and eastern sides, with its highest summit towards the S.E. end. A rock, 20 ft. high, lies N.E. by N. half a mile from its N.E. end. On the West side is a deep bay, with anchorage in 5 fathoms in its N.E. part in fine weather. This bay renders the island very narrow in the centre. At its entrance is a dangerous 4-feet rock, 150 ft. in diameter. It lies N. by W. ¼ W. from the S.W. point of the island, and the two rocks at the entrance of the bay E.N.E. in line lead nearly on to the danger.

Red Mercury Island (*Wakahau*) is the outer or easternmost of the group; it bears from the S.E. end of Great Mercury E. by N. 4 miles distant, with several islets and reefs between. It is 3 miles in circumference.

Richards Rock, a dangerous rock, which uncovers only at low water, lies N. by W. ¾ W. from the North cliffy point of Red Mercury Island, 1½ mile

distant; it also bears from the S.E. end of Cuvier Island S.E. by E. 11 miles; and from the N.E. end of Great Mercury Island E. by N. 7 miles. This outlying danger has deep water round it, and only breaks occasionally.

Ohena, the southernmost island, lies E. by N. 2½ miles from the North entrance point of Mercury Bay. Two low reefs, bearing from N. by E. to N.E., extend from 1 to 2½ miles off its North extreme. *Man* or *Old Man Rock*, W. ⅛ N. 1⅞ mile from Ohena, is about 80 yards in diameter, and 200 ft. high; it forms a valuable mark for steam coasting vessels. *Sunk Rock*, with 7 ft. over it, lies 2 cables N.E. by N. from the sunken danger situated E. by S., distant 2 miles from Tepaki Point, in the channel between Old Man Rock and the mainland.

MERCURY BAY, or Witi Anga, was visited and named by Cook. He gave its appellation on account of the observations made there of the transit of Mercury over the sun, November 9th, 1769. There are several islands lying both to the southward and the northward of it, and a small island or rock in the middle of the entrance, which rock has foul ground to N.E. and S.E. The best anchorage is in a sandy bay which lies just within the South inner head, in 3 and 4 fathoms, bringing Tower Rock (188 ft.), which lies without the head, in one with the head, or just shut in behind it. This place is very convenient for wooding and watering, and in the river there is an immense quantity of oysters and other shell-fish. For this reason it was named *Oyster River*.

Mangrove River.—For a ship that wants to stay here any time, the best and safest place is in the river at the head of the bay, which, from the number of mangrove trees in it, was called Mangrove River. To sail into this river, the South shore must be kept *all the way on board*. The least water in the channel into the river is 14 ft. at low water springs.

Fresh water can be procured round the high Pah Point, the western entrance point of the river, and there is a carpenter's yard near the anchorage, where ships have been repaired. A steam saw mill is situated at the entrance, and another about 6 miles up the river; these mills employ from 60 to 70 Europeans. During the two years 1871 and 1872, about 2,000 tons of kauri gum were shipped from the bay, but the gum is now reported to be nearly worked out.

Gum Town, situated about 9 miles up Mangrove River, contains three or four stores belonging to the Kauri gum traders. When the supply of gum ceases, this settlement will probably be abandoned. The township has a good pier available for vessels of light draught.

The North head of Mercury Bay is a very conspicuous promontory. The coasts and cliffs around the bay have very much altered since Cook's time.

Coasting vessels from the westward usually steer to pass 1 mile S.W. of Great Mercury Island, when Ohena Island is kept a little eastward of Man Rock, until the vessel is within a quarter of a mile of that rock. Pass about half a cable S.W. of Man Rock, and steer S.E. by E. for 1 mile, until Needle

Rock bears S.W., when the course should be shaped to pass eastward of Castle and Slipper Islands.—*Lieut. W. U. Moore*, 1880.

Approaching Mercury Bay from the southward, in the southern entrance is *Sunk Rock*, seldom showing, but which occasionally breaks; there is from 9 to 13 fathoms round it. It bears N.N.W. three-quarters of a mile from Te-Tui or Mahurangi, the island forming the southern entrance point of the bay, and E. by N. 1½ mile from Tower Rock, which also has some dangers surrounding it. The passages among these islands about the southern entrance should be avoided.

There are no other dangers in Mercury Bay than those which have been mentioned, until Shakspeare's Cliff is passed. The soundings will be found to decrease gradually, there being 10 fathoms on either side of the Middle Island, and 3½ to 4 fathoms up to Shakspeare's Cliff, off which a vessel may anchor, with the cliff bearing South to S.S.E., but should not proceed higher, unless intending to enter Mangrove River, to avoid *Pandora Rock* of 8 ft. and some detached banks of 9 and 12 ft., which extend nearly half a mile from the shore between Shakspeare's Cliff and the East entrance to Mangrove River. The northernmost of these, *Fly Bank*, is cleared to the northward by keeping the Twins just open of Koraya Islet, bearing N.E. ¾ N.

It is high water, on full and change, in Mangrove River, at $7^h\ 21^m$; the rise is from 5 to 7 ft. Vessels should enter at the last quarter flood.

The BAY OF PLENTY, a very comprehensive name, extends from Mercury Bay to Cape Runaway, a distance of 120 miles. It was called the Bay of Plenty by Cook, in March, 1770, because of the numerous population on the coast, which he believed to acknowledge but one chief, Taratu. But these people have been scattered and destroyed by the bloody wars carried on by E'Onghi and his fierce followers.

There are a number of islands and detached rocks in this extensive bay. The only anchorage in it of importance, and which offers shelter for any vessel larger than a coaster, is Tauranga Harbour. The coast trends from Mercury Bay S.E. by S. ½ S. towards this harbour, a distance of about 55 miles.

Castle Island (*Ngatutu*), a small steep islet, lies E. by S. ½ S., 4 miles from the South point of Mercury Bay; it is 50 ft. high, white in colour, and steep-to; 39 fathoms will be found at 3 cables distant.

ALDERMAN ISLANDS are a group of small islands, with off-lying rocks, lying E. by S. ½ S. 14 miles from Mercury Bay, and 9 miles from the nearest part of the main land. They are basaltic, the largest 150 ft. high, and cover a space of more than 4 miles North and South, and 3 miles East and West. Two rocks above water and one awash lie 2½ miles N.W. by N. from the eastern islet, as also two more 1½ mile W.N.W. from it; there is also a rock out of water, half a mile eastward of the southern islet.

At 10 miles southward of Mercury Bay is *Tairua River*, a small place avail-

able only for coasters; the intermediate coast is broken into sandy bays and cliffy points, with from 20 to 14 fathoms water a mile off shore.

Shoe Island, when seen from the N.W., exactly represents its name, even to the tie. It lies E.N.E. from the North cliffy head of Tairua, 1½ mile distant, and is about a mile in circuit; half a mile eastward of it are some black rocks above water. It has a small coasters' harbour, with 6 ft. at the entrance.

Slipper Island, so called from its shape, lies S.E. 4 miles from Tairua Head, and 2 miles off shore; it is nearly 2 miles long N.E. and S.W., and having a reef out of water, extending from its South end 1½ mile to the southward. Between Slipper Island and the main land, bearing S.W. 1¼ mile from the North end of the island, is a rock above water, 2 cables North of which is a sunken rock, which generally breaks heavily. There is temporary anchorage in fine weather under Slipper Island, in 6 fathoms, off a sandy bay on its S.W. side. At 3½ miles S.S.W. from Slipper Island is the Warekawa stream, at the southern termination of a sandy beach, 2½ miles long.

Whangamata River.—At 5 miles southward of Warekawa stream is Whangamata River; its North entrance point is cliffy, the South is a sandy point, with a round cliffy islet (Clarke Islet), projecting from it. S.E. of this islet, at distances of half a mile and a mile, are two smaller islets, the Wedge and Sugar Loaf. The two entrance points of the river project so as to form a bay outside, where a vessel may anchor with off-shore winds in 4 fathoms, half a mile from the shore, with the entrance open.

From Whangamata River to *Kati-Kati River* is 15 miles, with no dangers on the coast between them. The entrance of the latter, which is said to have only 1½ ft. on the bar, bears from Mayor Island S.W. by S. 15 miles. Capt. Carey, S.S. *Keera*, 1872, reported that the bar, on which was a depth of 18 ft. at high water neaps, was 1½ mile seaward of the North head; to enter the head should be brought to bear W.S.W. Inside there is plenty of room with 7 and 8 fathoms water. It is connected by a boat channel with Tauranga at high water. At 7½ miles W. by S. ½ S. from the Kati-Kati, and 3 miles off the sandy beach, is *Karewha Island*, 350 ft. high.

MAYOR ISLAND (*Tuhoua*) is S.E. ¾ S. 19 miles from the southern Alderman, and 14 miles from the main land, near Kati-Kati River. Between it and the southern Alderman are soundings in 50 fathoms, and 40 fathoms within a mile of the island.

The island is 7 miles in circumference, or 2½ miles long, N.W. and S.E., and 1½ mile in breadth; the northern peak is 1,100 ft. high; the centre is an extinct crater, open to the S.E., with stagnant water at the bottom. The western face of the island is covered with blocks of obsidian, giving it a remarkable dazzling appearance when reflecting the sun's rays. On the S.E. extreme is a pah, strongly defended by a deep cut or pass, partially artificial. Immediately West of the pah is a bay, where anchorage may be had with sandy bottom; but it is open to West and S.W. winds. At 1 mile East of the Pah Point is a

rock under water, which breaks with a moderate swell; it is half a mile from the nearest or S.E. point of the island.

TAURANGA HARBOUR, which, as before stated, is the only harbour on the East coast between Mercury Bay and Port Nicholson, that affords shelter in all winds for vessels of burthen, is 13 miles south-eastward of Kati-Kati River. Its entrance lies South 19 miles from the South end of Mayor Island, and W. ½ S. 11 miles from the South end of Motiti Island.

The difficulty of entering this harbour through the deepest channel, is its somewhat tortuous course, and the liability to eddy winds on rounding *Mount Monganui*. The line of breakers on the western shore has extended 3 cables to eastward since the survey. But with those winds which would make the Bay of Plenty a lee shore, Tauranga Harbour is the most accessible, and, when once inside, there is anchorage for a fleet. The entrance to the harbour lies nearly North and South; the eastern head is the remarkable flat-topped hill *Monganui* or *Maunganui*, rising abruptly from the sandy shore to a height of 860 ft. The western entrance is formed by low undulating sand-hills. At 1 mile north-westward of Monganui a spit with 9 ft. extends eastward from the western sandy shore for a mile; this spit generally breaks. After northerly and easterly gales the bar breaks rights across from Outer Middle Bank to Monganui Bluff for some hours, the depth in the channel being from 3 to 4¾ fathoms.

This harbour, from the Outer Middle Bank to the sand-hills North of Whareroa, was examined, re-sounded, and buoyed in 1879. The best time for large vessels to enter is at about 20 minutes after high water by the shore, as the tidal stream runs for at least 40 minutes after high and low water.

The approach to Tauranga Harbour is remarkably distinct. Vessels bound to it from the northward should bring the South end of Mayor Island to bear North, steering a South course; the high flat-topped hill of Monganui will first appear like an island. The course in is to steer South for North Rock, and then keep 1½ cable off the East shore, or by taking care not to bring the summit of Mount Monganui to bear to the eastward of S. by E. ½ E. until at a distance of one-third of a mile from its base, the bank extending off the western shore will be avoided; the channel is one-third of a mile wide, and deepens from 3½ to 7 fathoms. When between the *black buoy* on the eastern side of entrance, and the *red buoy* on the western side, steer so as to pass within 30 yards of the beacons on Stony Point and haul close round it; here the channel is not much more than half a cable wide. The South side of the channel, opposite Stony Point, is marked by two red buoys; and the western side of the channel, South of Stony Point, is also marked by two red buoys. The buoys are not be depended on.

After Stony Point is passed Monganui is again quite steep-to, and a good anchorage is found in 6 fathoms, in the first sandy bight, a cable from the

shore. The two *beacons* on Stony Point consist of staffs and cages, the inner painted *black* and the outer *white*. The signals are described on p. 349.

Vessels of any size can proceed a mile above Monganui, carrying from 5 to 7 fathoms water. The eastern edge of the main bank opposite Maketu Mound is marked by two pile beacons.

Te-Papa is the Protestant mission station. The channel leading to it from the anchorage in 6 or 7 fathoms, off Maketu Mound, near which the main channel divides, has 7 ft. water. H.M.S. *Rosario*, drawing 14 ft., frequently went up as far as Te-Papa at spring tides. The site of the mission is well chosen on elevated ground, on the South side of the harbour, 3 miles from Monganui; 2 miles westward of it is *Otumoiti* village, where there is a Roman Catholic mission establishment. Fresh water can be obtained just within Stony Point in small quantities, and pigs and poultry may be had from the natives at reasonable prices.

A large tract of land of superior quality in this district is being settled, and promises to be one of the most successful settlements in the province.

It is high water, on full and change, at $7^h\ 10^m$; rise of tide $4\frac{1}{2}$ to 6 ft. The strength of the tide at springs is 3 knots; in the narrow channel at Stony Point it may attain 4 knots.

From Tauranga Harbour the coast, which is a uniform sandy beach, runs E. by S. for 15 miles to Kaituna River. The land between is covered with fern, and low, with the exception of two hill ranges of 600 and 800 ft., which rise 1 mile inland and extend to the S.W. A remarkable flat-topped range of hills, about 1,000 ft. high, rises 10 or 12 miles inland of Tauranga, and extends in a north-westerly direction.

Kaituna River.—Town Point (*Okure*), which is the East head of Kaituna River, is a cliff 100 ft. high; from it towards Motiti Island the ground is very foul, but no rocks are known to exist more than 1 mile off, that would bring a ship up. There is only 3 ft. on the bar at low water. Just within the entrance, on the S.E. side of the river, is the large Pah of Maketu, a missionary station.

MOTITI ISLAND, which is 6 miles N.N.W. of the mouth of the Kaituna, is flat, and triangular in shape; it is $3\frac{1}{4}$ miles long North and South, and $1\frac{1}{2}$ mile East and West. Its greatest elevation, 190 ft., is at the northern end; the rest of the island is not more than 100 ft. above the sea. This part bears from Mayor Island S.E. by S. 19 miles, and from Monganui Hill E.N.E. 11 miles.

The distance between the South end of Motiti and the main land is 4 miles, with 12 fathoms, sand, in mid-channel. There are two tidal rocks 4 ft. high at low water, E. by S. $1\frac{1}{4}$ mile from the South end, and another rock awash, between them and the point. A narrow ridge, with from 2 to 4 fathoms on it, extends for about a mile S.W. by S. from the South extreme of Motiti Island.

H.M.S. *Pandora* anchored off the N.W. point of the island, half a mile from

the shore, in 14 fathoms, rocky ground. The holding ground on all sides is very indifferent, and the East and S.E. sides should not be approached within 2 miles.

Schooner Rocks, 62 ft. high, and named from their likeness to a small craft at a distance, are 4 miles E.N.E. from the N.E. end of Motiti Island; they are bold-to. A *breaking rock* has been seen about three-quarters of a mile N. by E. ¼ E. from Schooner Rocks.

Astrolabe Rock * lies North 4 miles from the North end of Motiti Island; it is detached and uncovered at low water springs. The whole extent of the danger is not more than 2 cables, extending E.N.E. and W.S.W., and would break almost always, but as it is covered at high water, in very fine westerly weather it might not show. From it Monganui Hill bears S.W. ½ W.; the centre of Mayor Island, N.W.; and the right extreme of Motiti Island, S. ¼ W.

A dangerous rocky patch, *Okorapu Reef*, with about 5 ft. on it at low water springs, has been discovered in the fairway of vessels passing between Motiti Island and Astrolabe Reef, bound to or from Tauranga. The patch extends about 200 ft., and from it Monganui Hill bears S.W. by W. ¼ W. 9¾ miles, and the North point of Motiti Island E. by S. 2¼ miles. Breakers are also reported to have been seen at about 2 and 3 miles westward of this reef.

This neighbourhood should be avoided at night, as Motiti Island is low, and there is no other land near enough to guide the mariner.

Plate Island (*Motu Nou*), 166 ft. high, so named from its hollowness in the centre, lies E. by N. 7 miles from the South end of Motiti, and S.E. ½ S. 3½ miles from Schooner Rocks. Between them there is 20 to 40 fathoms water. A rocky patch, *Tokeroa Shoal*, about three-quarters of a mile long N.E. and S.W. by half a mile broad, lies S.W. of Plate Island; the least water found on it was 3 fathoms, with the South extreme of the island bearing N.E., distant 1½ mile.

Waihi and Matata Rivers.—One mile south-eastward of the Kaituna is *Waihi River*, which runs in many branches through an extensive flat. At 15 miles E. by S. ½ S. from the same point is Matata River, with a straight sandy beach the whole way. At Matata River coasting vessels are built. The white cliffs coastwise north-westward of Matata rise to a height of 500 feet.

MOUNT EDGCUMBE (*Putanaki*) rises abruptly from the plain (of which it is the southern boundary) to the height of 2,575 ft.; it is 14 miles South of Matata River, and on the summit is said to be a lake of green water, probably the old crater of a volcano.

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* This rock, which very nearly proved fatal to D'Urville's ship, was supposed by him to be 5 miles South of the Mayor; but on the survey by Capt. Drury, he found no such rock in the situation assigned, and was convinced that this must be Astrolabe Rock.

Whale Island (*Motu Hora*) **and Ru-Rima Rocks.**—At 4 miles off this part of the coast is the island Motu Hora and Ru-Rima Rocks; the former is N.W. by N. 5 miles from Whakatane River, and the dangerous Ru-Rima Rocks lie 4 miles West from Motu Hora. There is a passage 2½ miles wide between them and the shore, with soundings varying from 9 to 17 fathoms. Whale Island is 1½ mile in length and 1,167 ft. high; H.M.S. *Pandora* anchored in 6 fathoms under a shingle spit off its S.W. end. Ru-Rima Rocks cover a space of 4 miles East and West and 3 miles North and South; some are high above water and others awash, the highest rising to 120 ft., at 4 miles West of the North end of Whale Island.

Whakatane River.—At 13 miles eastward of Matata River is Whakatane River. Kohi Point, its N.E. point, is 637 ft. high, and has been covered with several pahs, the ridges and ditches of which have a curious appearance. The channel into this river is between large boulder rocks just covered at high water; these rocks are on either side of the bar, which at low water has only 2 ft. on it, and 9 or 10 ft. at high water springs.

Whakatane River is a favourite port for the coasting trade. Schooners reach as far as Pupuarue, the mission station, 3 miles up, from whence the river bends to the S.E., and flowing through the hill ranges at the back, takes the name of Orewera.

Ohiwo River, at 7 miles eastward of Kohi Point, is broad at the entrance, being half a mile across at high water, but appears surrounded by shoals; the bar is a mile to seaward. A wooded cliff, about 500 ft. high, half a mile eastward of the river, forms a good mark.

At 6 miles further eastward—the stream of Wai-o-tahi lying between—is *Opotiki River*. The entrance is not more than a cable across; both heads are sand, with no natural marks to lead in. The bar changes with freshes, and N.E. gales also affect it, the depth varying, but the river is navigable for ordinary coasters for 1 mile inside; the channel is marked by moveable beacons. The church mission is on the western branch, 3 miles from the mouth.

WHITE ISLAND (*Whakari*), an active volcano, in lat. 37° 30′ S., and long. 177° 12′ E., lies off the depth of the Bay of Plenty, 28 miles from the shore. It is about 3 miles in circumference, and 860 ft. high; the base of the crater is 1½ mile in circuit, and level with the sea. On it is a boiling spring about 100 yards in circumference, sending volumes of steam fully 2,000 ft. high in calm weather.

Here and there are lakes of sulphureous water dormant; but the whole island is heated so as to make it difficult to walk. From the edges of the crater, the scene below is only to be compared to a well-dressed meadow of gorgeous green, with meandering streams feeding the boiling cauldron; but on approaching, it is found to be the purest crystallized sulphur. No animal or

insect breathes on the island, scarcely a limpet on the stones, and 200 fathoms will hardly reach the bottom within half a mile of its shores.

The island is the eastern limit of that extensive belt of subterranean agitation which extends from Mount Egmont through Tongariro, the Taupo and Roto Mahana Lakes, to Whale Island and the adjacent rocks Ru-Rima, North of which line earthquakes are rarely felt.

Volkner Islets, three rocky islets, from 80 to 150 ft. above the sea, lie 3 miles N.W. by W. from White Island, and another lies half a mile off its S.E. end.

The Coast, from Opape Point, where the straight sandy shore terminates, trends about N.N.E. 22 miles to Waikana Point, and its features are strikingly changed, being now broken into numerous small sandy or shingle bays, with rugged cliffy points between.

From Waikana Point to Orete, the southern point of Wangaparawa Roads, is N.E. 9 miles. For the first half of the distance, as far as Kotiki Point, the coast is steep and rugged, with 35 fathoms, mud bottom, 2 miles off shore, decreasing to 20 fathoms at the same distance towards Orete Point; for the remaining distance there are shingle beaches and rocky points, with three villages, and the small stream of Rau-Ko-Kore.

Immediately West of Orete Point there are sunken rocks three-quarters of a mile from the shore, and the ground is everywhere foul within half a mile of the coast.

CAPE RUNAWAY was thus named by Cook, from the flight of the natives, who commenced hostilities with him October 31st, 1769, and is the eastern termination of the Bay of Plenty. It is nearly 6 miles north-eastward of Orete Point, is of an oval shape and dark colour, appearing almost like an island, and forms the N.E. point of Wangaparawa roadstead. There are detached rocks lying a quarter of a mile to the northward of this cape, and E.S.E. from these rocks is another rock awash at low water. It is recommended to give this cape a good berth as the tide runs strong in its vicinity, and there is generally a swell.

Wangaparawa Roadstead.—With S.E. winds there is an anchorage in this roadstead off what was a whaling station 2 miles S.S.W. of Cape Runaway. Vessels of burthen should not approach the shore within a depth of 12 fathoms, anchoring about a mile West of the conical hill over the station. Upon the slightest appearance of a westerly wind, a vessel should not remain at anchor off the whaling station; and although well sheltered from a N.E. wind, it would be dangerous to ride a breeze out from that direction. The anchorage under Orete Point, about half a mile within it, affords excellent shelter in S.W. and westerly winds, by bringing the outer extreme of the rocks extending off it to bear W. by N., and anchoring in from 10 to 7 fathoms, fine sand.

Lottin Point is 9 miles East of Cape Runaway; in making the land from

the northward, this point of the coast may be distinguished by a peak to the southward, and will be seen much higher than the general range, and by the land being lower to the westward of Lottin than towards Hicks Bay. There is no anchorage on this part of the coast.

Hicks Bay is nearly 2 miles deep by 1½ mile wide, and is open to the eastward. The North point, Motakawa, 8 miles eastward of Lottin Point, is a long low rocky tongue of indurated sandstone, with a crust of scoria; the rocks off it are all visible, and there is 25 fathoms water within a cable of the entrance. The South point, Ko-hau, or Iron Point, is almost inaccessible. Hicks Bay affords secure anchorage in all westerly winds, from North to South; from North winds also, which are not uncommon, it is sheltered; but vessels must get well within Motakawa Point. N.E. gales, which generally spring up from the eastward and gradually freshen, give sufficient warning to weigh. No vessel should lie here with N.E. or S.E. winds.

Awatere River is 3 miles E.S.E. from the South point of Hicks Bay, at the eastern extreme of the sandy Bay of Panaruku. At 1½ mile westward of it, and about a mile from the beach, is the Kawa-Kawa roadstead, with anchorage in 9 to 12 fathoms, sheltered from S.E. winds.

Fresh water can be obtained in Hicks Bay from a gully within half a mile of Motakawa Point. Supplies may be obtained from a native village (Wharekahika) in the S.W. nook of the bay.

EAST CAPE and Islet.—From the North point of Hicks Bay to the East Cape Islet, is E. by S. ¾ S. 14 miles. The land about East Cape has a very mountainous appearance; the summits of five distinct ranges may be seen backed by the snow-capped *Ikaurangi*, a most conspicuous mountain, rising to the height of 5,535 ft., 28 miles S.W. of the cape. The cape itself is of a remarkable white clayish sand, and this barren feature is continuous to Hicks Bay, and also to the southward.

The *islet*, half a mile in circuit, is a type of the cape, with but a small proportion of stunted verdure; it is steep, almost inaccessible, and bounded by rocks, with a ledge extending from its northern extreme, N.N.E. half a mile. There are said to be sunken rocks 2½ miles E. by N. of the East Cape, but Captain Drury believes it arises from the race being very heavy. When the western points trending to Hicks Bay are well open, the islet anchorage will be found in 16 fathoms, within 2 miles of it; and when the weather admits, a vessel might ride out the tide to great advantage. There is a channel nearly a mile wide between the cape and the islet, but it cannot be recommended.

There are several shoal patches off East Cape, which, together with the strong tides, make the passage not a desirable one. A shoal patch with 3¼ fathoms water on it, on which the sea would break in heavy weather, lies off the N.E. point of the cape about two-thirds of a mile, and another patch, nearly a mile S.E. ⅜ S. of the former, with 2½ fathoms water on it.

There is good anchorage on either side of the cape, which is very advan-

tageous for vessels going either way, as the wind generally blows along the land, therefore they can always get a smooth anchorage.

The *winds* on either side of East Cape are frequently very different, although it may be blowing fresh. The strong westerly sea breezes which blow through the Bay of Plenty are suddenly lost when passing South of East Cape Islet, the distinct line of breeze being curiously depicted on the water, and a vessel may be becalmed here for hours in sight of strong breezes.

Tides.—It is high water at 9^h 0^m, on full and change; the rise is 7 ft. Northward of East Cape the flood tide sets to the westward, southward of it the flood sets in a northerly direction.

At 6 miles southward of East Cape is *Wai-apu River*, flowing through a sandy beach; it is a considerable stream at high water, but the freshes come down with great violence, so as to render it unsafe as an anchorage even for the smallest vessels. H.M.S. *Sappho*, in 1875, anchored off its mouth in 7 fathoms, about three-quarters of a mile off shore, with the East Cape bearing N. by E., distant 5 miles; and the North entrance point of the river W.S.W. This anchorage, affording shelter from off-shore winds, is much frequented by coasting vessels wind-bound.

The next point nearly 4 miles South of this river is Whahariki, the South point of the Awanui Stream, the land over it being 950 ft. high: there are rocks extending for half a mile round this point, and midway between it and Wai-apu River a sunken rock lies a mile off shore. *Kaimouhu*, a round head 670 ft. high, 3 miles northward of Open Bay, is the next headland. Sunken rocks extend off it for a mile to seaward.

Open Bay (*Waipiro*) will be known by Tawhiti Hill, which rises 2 miles South of the southern head, and is 1,670 ft. above the sea. The width of its entrance is 4 miles from North to South, and little more than one mile in depth; there is a considerable stream in the south-western corner of the bay, but the landing there is generally difficult. This bay can only be considered as a temporary anchorage, with off-shore winds, and there are some rocks in it which require care.

From Open Bay the coast trends S. by E. for 20 miles to Tolago Bay, the Bays of Tokomarua and Waipari lying between. Some reefs lie off this part of the coast distant more than a mile.

No vessels, except such coasters as know the channels among the rocks, should attempt Tokomarua Bay; it is moreover a very open anchorage.

On the South side of Mawai Point, the South point of Tokomarua, there was a whaling station in *St. Patrick's Cove*, a small nook which is well sheltered for boats; it takes its name from a curious pinnacle, which, seen from seaward, appears like the gigantic figure of a man with his arms folded.

Marau Bluff is nearly 7 miles southward of Mawai Point, and 4½ miles northward of Tolago Bay; a reef of rocks awash (Tokamapuhia) lies more than a mile eastward of this bluff.

TOLAGO BAY (*U-awa*) is 1¼ mile across, N.N.W. and S.S.E., from head to head, and about the same distance in depth; in it there is anchorage in all westerly winds ranging from North to South. The North head rises to 400 ft., and the South to 890 ft., both composed of the white marl so conspicuous along this coast. An island and a reef lie off the North head. *Sporing Island*, three-quarters of a mile long North and South, lies immediately off the South head, with a fordable depth between. It is surrounded by rocks; off the North and South ends they extend a third of a mile.

Tolago Bay is clear of dangers. On the setting in of easterly winds, vessels should leave in good time, for the outer reef renders the beating out somewhat tedious.

Within the South head of Tolago Bay is the cove where Cook watered, and beyond it is to be seen the remarkable arch in the cliffs which he has described; several initials are cut out on the rock, where the artificial well exists made by his crew; there is some difficulty in getting water during the dry season. H.M.S. *Pandora* obtained provisions here better, and at a more reasonable rate, from Europeans and natives, than anywhere else on this coast. *U-awa River* at the head of this bay has a bar of 5 ft., but it has been ascended by a small vessel drawing 6 ft. for a distance of 16 miles from its mouth. There was a population of 35 Europeans and 200 natives here in 1873.

CAPE GABLE, or Gable-End Foreland (*Pari-nui-tera*), was so called by Cook from its having a glaring triangular face, appearing like the white-washed gable-end of a house. The appearance is contracted when within 3 miles of the land, but seen from the eastward it is very prominent; there are two patches of detached rocks 1½ mile North of the cape, about three-quarters of a mile from the beach; and a small islet one-third of a mile S.E. of it, with a reef extending half a mile in the same direction. A reef of rocks also extends South of the cape at a distance of 2 miles. It is very probable that it was on or near this reef that the steamer *Star of the South* struck in March, 1865; the Gable-End Foreland bore at the time N.N.W., distant 3½ miles, and Whangara Islet W.S.W. about 3 miles.

From Cape Gable the coast trends S.W. by S. for 15 miles, to Tua-hini Point, the North head of Poverty Bay; the shore between is rugged, with sterile hills rising to a height of 600 ft.

POVERTY BAY (*Turanga*) is 5 miles in breadth from head to head, which lie N.E. and S.W. of each other, and are the southernmost white-coloured projections on the coast, until Table Cape (24 miles further to the southward) is reached; the bay is 4 miles in depth.*

* The master of the ship *Excelsior* in 1873 states that the anchorage at Poverty Bay is good; the ground being stiff clay, there is no fear of dragging, and from strong S.E. winds, which are rare in summer, a ship loading in the bay could find shelter under Young Nick's Head.

"The S.W. point of the bay I named *Young Nick's Head*, after the boy Nicholas Young, who first saw the land." This was the landfall of Cook in New Zealand; he then thought he had come on the *terra australis incognita*.

The South, or Young Nick's Head, is 520 ft. high, and has anchorage 1½ mile within it off Wero-Wero River, in 8½ fathoms, half a mile from the mouth, but it is advisable not to approach the shore nearer than half a mile in entering, as the ground is very foul, changing from 8 fathoms to 9 ft.; the bottom, however, is not rock, but apparently composed of vast fragments of the pipe clay cliff, which have from time to time slipped away—a common occurrence on this part of the coast, so liable to smart shocks of earthquake, and upon which the sea is rapidly advancing. The North head (*Tua-hini*), 260 ft. high, has also foul rocky ground, extending to the S.E. for 2 miles.

There is anchorage all over the bay, but it is recommended to weigh on any appearance of a breeze from the S.E., for from this quarter it freshens suddenly, and several vessels have been lost by waiting too long. *Hawea Rock*, on which the steamer *Hawea* touched in 1879, lies about 1¼ mile off the North shore, with Pa Hill, a conical hill 470 ft. high, bearing N.E. ½ N., and the South extreme of Tua Motu, E. ½ S. Another rocky patch of 3¼ fathoms was discovered in 1883, with the flagstaff at Turanga-nui River entrance, bearing N. by E. ⅝ E., distant about 1¼ mile, and Tua Motu Rock, E. by S. ½ S.

There are three small rivers in the bay, Turanga-nui, Koputetea, and Wero-Wero. The first-named is celebrated as the place where Cook first landed in New Zealand. From the untoward circumstances attending his landing, and unsuccessful attempts to obtain provisions, he named the bay Poverty.

Turanga-nui River is 2 miles westward of Tua-Motu Peninsula, on the North side of the bay. Stakes have been placed to mark the passage over the bar, which is close to the westward of the stakes. At high water, vessels drawing 8 ft. can, if the sea be smooth, cross the bar. Half a mile above the bar the river branches off to the N.W. and N.N.E. The depths vary at low water from 3 to 6 ft. up to Reed's store, where the coasters lie. *Water* in abundance can be had within the banks of the river. In two places barrels have been sunk just above high-water mark, from which a plentiful supply of water can be obtained.

Light.—A *fixed red* light, elevated 38 ft. above high water, and visible 5 miles, is shown from the flagstaff on the West side of the river entrance. The harbour master reports that the best anchorage for steam vessels is in 6 fathoms, with the light bearing N.N.E.; westward of that the ground is foul.

The rising town of *Gisborne* is situated in a rich agricultural district, on the right bank of the Turanga-nui River, near the entrance, and in 1881 contained a population of 1,737. For communicating with Gisborne, the best anchorage is in 7½ fathoms, about three-quarters of a mile to the S.W. of a buoy which is (or was) moored in 2½ fathoms off the entrance of the river, in the vicinity of

a rock discovered by the New Zealand Government vessel *Luna*. The buoy was washed away in 1875. Coasting steamers call here regularly.

Koputetea River has about the same water on the bar as Turanga-nui, and may be known by a Maori village and a flagstaff on its North bank. At low water the surf breaks across the bar. The Church Mission station, on the West bank, 3 miles from the river's mouth, in 1873 was only represented by a school room; the church, which is full of fine Maori carvings, was rapidly falling into decay.

Wero-Wero River, the southern of the three rivers, is completely blocked up by the sand and shingle thrown up during heavy weather.

At Wero-Wero River the time of high water, on full and change, is $6^h\ 5^m$, rise of tide 6 ft. The flood tide outside sets to the northward, the ebb to the southward, and their influence extends 10 miles from the shore. Within Poverty Bay the tide is scarcely perceptible.

From Young Nick's Head, Poverty Bay, to the neck of Mahia Peninsula, a distance of 19 miles, the coast is bold, and may be approached as near as convenient.

ARIEL ROCKS, a very dangerous outlying reef, which breaks only in heavy seas, bears E. ¼ N., and is 10 miles distant from Tua-hini Point, the North head of Poverty Bay; at low water spring tides it has on the shoalest part a depth of 12 ft.; this dangerous portion is less than half a mile in a North and South direction. They are steep-to. The vicinity of this reef may be known by the bottom being composed of coarse gravel and stones within a radius of 2 miles; if the soundings exceed 35 fathoms a vessel is to the eastward of the reef. The following are the bearings from the rock: Cape Gable (a conspicuous white cliff), N. by W. ¼ W. 12 miles; Tua-hini (North head of Poverty Bay), W. ½ S. 10 miles; False Gable (the nearest point of land), W. by N. ½ N. 8½ miles.

MAHIA, or TERA-KAKO PENINSULA, forms the northern head of Hawke Bay. It is 12 miles long in a North and South direction, and nearly 9 miles N.E. and S.W. in its widest part. It is connected with the main by a sandy neck about 2 miles in length, and three-quarters of a mile broad; a river flows through this sandy neck and runs into the sea on the eastern side; this, when it is swollen, gives Mahia the appearance of an island. On the outside of this neck, which is W.N.W. 5½ miles from Table Cape, there is anchorage with S.W. winds a mile from the beach.

On the North coast of the peninsula, 3 miles West of Table Cape, there is a good roadstead off *Wangawai River*, affording shelter in South and West winds. The anchorage is in 10 fathoms, mud, Table Cape bearing E. ½ S., and 1 mile North of the river; it is safe during the ordinary sea breeze, but care must be taken to leave on the approach of easterly winds.

From Table Cape the East coast of the peninsula trends S.S.W. 12 miles to its extreme point, and is studded with off-lying dangers. The first of these

dangers is a reef 3 miles southward of Table Cape, extending three-quarters of a mile from the shore off Taiporutu. One mile further South is a detached reef 3½ miles long; the outer ledge 2 miles from the shore, and leaving a channel within, half a mile broad, sometimes taken by coasters, but not recommended; the northern extreme, or Hawini Rocks, are 6 ft. above water, the rest covered and only occasionally breaking. At 3 miles S.E. by S. of this ledge is a sunken rock, named *Bull Rock*, seen by Capt. Cook, over which a sector of *red* light is shown from Portland Island lighthouse. The true position of this isolated danger is 3¾ miles E. by N. of the South point of Mahia Peninsula, and 4¼ miles N.E. of the South extreme of Portland Island: 20 fathoms will be found within one-third of a mile round it. Another reef exists midway between this danger and the extreme of Mahia. These two rocks have at least 8 ft. of water on them, and only break when there is a swell. With a high south-easterly sea running, heavy breakers have been observed between Portland Island lighthouse and Bull Rock, distant about 2½ miles from the island.

PORTLAND ISLAND.—South of Mahia Peninsula extreme, 1 mile, is Portland Island (*Te Houra*), so named by Cook from its resemblance to the well-known headland in the English Channel. It is nearly 2 miles in length in a N. by E. and S. by W. direction, of moderate height, and has a flat summit with a few bushes on it. A channel exists between it and the shore a quarter of a mile wide, with 6 fathoms between the rocks on either side, but it cannot be recommended. The South extreme of Portland Island is foul, but not extending more than half a mile from the shore.

LIGHTHOUSE.—On the South point of Portland Island is a white wooden lighthouse, 28 ft. high, from which is shown a *revolving bright* light, attaining its greatest brilliancy once every half minute, at an elevation of 300 ft., and visible 24 miles in clear weather. From the lower part of the lighthouse a *fixed red* light is shown through an arc of about 6° over Bull Rock, 4 miles to the N.E.

From the preceding remarks, it will be noticed that the East coast of North Island from East Cape to Hawke Bay, a distance of nearly 100 miles, has only two roadsteads for ships of burthen, viz., Poverty and Tolago Bays; and although coasters do sometimes anchor in Open and Tokomarua Bays, yet these can only be approached in fine weather, and do not deserve the name of anchorages; also, that the coast has many dangers within 3 miles of it, and that even in fine weather and with westerly winds there are few spots where cargo can be shipped by vessels anchoring cautiously off the coast.

Besides carefully avoiding Ariel Rocks, and the off-lying dangers from Mahia Peninsula, a stranger should not approach the coast thus described nearer than 3 miles; the position of a vessel can be well determined by the soundings, which will be found to decrease from about 40 fathoms, at 6 miles off shore, to 24 fathoms at 3 miles off; the bottom being green mud outside 24 fathoms, and fine sand within that depth.

The coast from Mahia Peninsula to Cape Palliser, a distance of 180 miles, is still more destitute of shelter than that just described; and with the exception of a few fine-weather anchorages in Hawke Bay, there may be said to be none along the whole extent of coast line.

HAWKE BAY, so named by Cook after Sir Edward Hawke, the First Lord of the Admiralty, is an extensive inlet, the distance from Mahia Peninsula, its northern limit, to Cape Kidnappers, its South extreme, being 42 miles in a N.E. and S.W. direction, the depth of the bay being 22 miles; it is entirely open to S.E. winds, affording no shelter beyond temporary anchorage. Of these anchorages the principal are off Long Point, on the West side of Mahia Peninsula, at Ahuriri, and at Cape Kidnappers. Long Point affords shelter during N.E. and S.E. gales, and Cape Kidnappers in south-westerly.

Long Point Roadstead, on the N.E. extreme of Hawke Bay, is sheltered from all winds but westerly. The holding ground is not always good, but by anchoring a mile from Long Point, and bringing it to bear S.S.W., there is good protection from the black north-easter, and ample room to weigh. The black north-easter is so called as distinguished from the summer sea breeze from the same quarter. To ride out a South wind, it is requisite to get well and close inside Long Point, until an opening or cleft shows itself; bring the point to bear S.W., in 7 fathoms, blue clay; this is the best holding ground. If a S.W. wind sets in, proceed to Wangawai Road. Long Point affords an excellent supply of water.

There were several whaling stations on the West side of Mahia Peninsula, directed by Europeans with New Zealand crews; but with the extinction of the whales they have disappeared.

At 20 miles to the westward of Long Point, is the entrance to the *River Wairoa*, on the banks of which a settlement is formed; and 11 miles further to the south-westward is the small *River Mohaka*, but the entrances are difficult.

AHURIRI or PORT NAPIER.—This port is in the S.W. bight of Hawke Bay, and is not adapted for vessels drawing over 9 ft. water; it is the only harbour deserving the name between Tauranga and Port Nicholson, and is capable of considerable improvement. The South head is a cliffy bluff, which, rising out of the low land, appears like an island; the entrance between the jetties is narrow, but when inside it expands into a large sheet of water. A *black buoy* is moored off Meanee Point, and should be left on the starboard hand in entering.

The anchorage is in 6 fathoms, good holding ground, about 1 mile off the harbour entrance, with the bluff just described bearing S.E. by E., Cape Kidnappers being shut in. These roads are safe in South, S W., and N.W. winds, and during the ordinary summer, N.E. sea breezes, which are termed the black north-easters, give ample warning of approach.

Lights.—A *fixed bright* light, 160 ft. above the level of the sea, is shown

from a tower 20 ft. high, on the eastern side of Napier Bluff, half a mile South of the extreme point, and should be seen from a distance of 18 miles in clear weather, when bearing between N.N.W. and S. by W., through West. Vessels must be careful not to mistake the bright sector of the light on the eastern pier at the entrance of the port for the light on the bluff.

A *fixed* light, elevated 27 ft., and visible 7 miles, is shown from a black open structure on the eastern pier, 190 ft. within its extremity. It shows *bright* between N.E. ½ E. and N.E. ½ N.; thence *red* to N.E. by N. ¼ N. over Pania Rock; thence *bright* to N. ¾ W.; thence *green* to N.W. by N. ½ N. over the anchorage; and *bright* westward of the anchorage. In approaching from the southward, the bright sector should be well open before rounding Ahuriri Bluff, in order to avoid Auckland Rock.

In approaching Ahuriri Roads, care must be taken to avoid *Pania Rock*, a danger with only 8 ft. on it, bearing N. by E. ¾ E. from the bold white cliff of the bluff, 2 miles distant; the bottom is uneven to the North of this reef. A *white conical buoy* lies in 9 fathoms, at about a cable S. by W. from Pania Reef, with the bluff bearing S.S.W. nearly, distant 2 miles. The average depth on the reef is 12 ft., but there are several rocky ledges with only 7 and 8 ft. water on them.

The buoy on *Auckland Rock* has been removed in consequence of its having been so frequently washed away. The depth on this rock at low water is 18 ft. From it the bluff bears S. by E.; the West point of the bluff S.W. by S.; Cape Kidnappers S.E. ½ E.

A *mooring buoy* lies in 6 fathoms, in the S.W. part of the roads W.N.W. from the bluff, and about a mile from the shore. The moorings are placed in the best holding ground, and are sufficiently strong for a vessel of 1,000 tons. A strong set of moorings are laid down for the use of ships loading wool.

Water.—The only fresh water available for ships within 3 miles of the entrance to Port Napier is from a tank which holds about 16 tons of rain water. The surf on the bar renders watering a precarious operation.

The banks and channels at the entrance shift considerably and frequently with the very rapid tides, therefore no permanent directions can be given. It is high water, on full and change, at $7^h\ 50^m$; springs rise 3 ft.

The town of Napier and buildings round the port are rapidly advancing, and the communication with the settlements of the interior being so simple, both by land and water, this fertile province of Hawke Bay will become of great importance. The inland navigation near Ahuriri is a great natural acquisition to this province, besides the Ahuriri. The European population of Port Napier, in 1881, numbered 5,756. A railway nearly connects Napier with Wellington and New Plymouth; the lines are not yet completed, but the finished sections are united by a service of coaches.

Nearly the whole of the swampy ground in the port has been reclaimed.

There are several houses on the eastern spit, also a landing pier on the South side of the spit.

KIDNAPPERS CAPE, or Mata-Mawi, the South point of Hawke Bay, is "very remarkable by two white rocks, like haystacks, and the high white cliffs on each side. Its first name was applied from the circumstance of the natives trying to carry away the son of Tupia, a little boy on board Cook's ship. This led to some loss of life among these ferocious people."

Cape Kidnappers anchorage is the shelter afforded by a reef extending from a point a mile westward of the cape; the best, though not good, anchorage is a mile S.W. of the extreme.

A sunken danger is reported to lie about W. by N. $\frac{3}{4}$ N. 1 mile from Cape Kidnappers, on which the barque *Mercia* is stated to have lightly touched in 1881; mariners are therefore recommended not to approach the cape nearer than 2 miles.

From Cape Kidnappers to Cape Turnagain, a distance of 48 miles, the trend of the coast is S. $\frac{1}{2}$ W., offering no remarkable or striking feature.

CAPE TURNAGAIN of Cook (*Te Poro Poro*), is a well-marked cliffy projection, making as a white bluff from the northward, and as table-land from the southward. The coast to the southward of it recedes for some miles to the westward, forming a bay open to the S.E. Another hill, the Chalk Nipple, so called from its white appearance, rises immediately over the coast 3 miles to the northward of the cape.

From Cape Turnagain the direction of the coast is S.S.W. for 40 miles to Castle Point. The shore is frequently faced with rocks. The hills slope gradually. There are small wooded valleys, but the country generally is hilly (from 500 to 1,200 ft.), apparently covered with natural grass; no dangers are known to exist more than $1\frac{1}{2}$ mile from the coast, but no stranger should approach the land within 3 miles.

CASTLE POINT is a rock nearly detached from the shore, with a sandy bay 2 miles long to the northward; from the North it presents the appearance of a square tower at the extreme of a low point.

FLAT POINT.—At 18 miles S.S.W. of Castle Point is Flat Point, a low projection with a sandy tongue running a short distance out, and a rocky ledge extending 1 mile from it to the northward.

The coast, for a distance of 12 miles S.W. of Flat Point, is fronted with outlying sunken rocks, extending in places $1\frac{1}{2}$ mile from the shore. H.M.S. *Eclipse*, in December, 1864, found one awash at $1\frac{1}{2}$ mile E. by S. $\frac{1}{2}$ S. from Flat Point; also a reef $2\frac{1}{2}$ miles long N.E. and S.W., and N.E. $\frac{1}{2}$ N. 2 miles from Flat Point. *Kahau Rocks*, a small cluster above water, lie 1 mile off shore, 9 miles from Flat Point, and 29 miles from Cape Palliser. The S.S. *Rangatira*, 1876, grazed on a shoal supposed to lie E.N.E. 2 miles from Kahau Rocks. The weather at the time being thick, the exact position of the danger could not be ascertained. Other dangers are said to exist in the same locality.

From Flat Point to Cape Palliser is S.W. ½ S. 42 miles; the coast line itself is low, formed of sand and shingle beaches, with rocky points and ledges extending in places a mile off shore. The ranges of hills increase in elevation as Cape Palliser is approached, where a high, steep, and sterile mountain range, within 2 miles of the extreme of the cape, attains an elevation of 2,850 ft.

CAPE PALLISER is the South extreme of North Island, and the S.E. entrance point to Cook Strait; it forms a remarkable bold-looking promontory from a distance, but as it is approached, two low shelving points will be seen to extend from it to the southward. A reef, partly above water and awash, runs half a mile from the eastern of these two points; and Black Rocks, 15 ft. above water, extend 1 mile from the western; strong tide ripplings also extend 1½ mile from the cape, and vessels should not round it within 2 miles, even in fine weather; at this distance will be found 35 fathoms, sand and shells.

Having described the eastern coast of North Island, we proceed to give the necessary directions for the *western* coast, going from the North towards Cook Strait, which will form the next section.

The WEST COAST of North Island consists of a series of straight beaches curving to the West towards Cape Egmont, a length of nearly 340 miles, through which are the entrances to the various harbours which so singularly cut up the northern peninsula, so that the sea nearly meets on the opposite sides. All these harbours have shifting sand-bars, which demand the utmost caution, and have been the scene of many disasters.

CAPE MARIA VAN DIEMEN, which, with its *lighthouse*, has been described on page 351, is lower than the land East of it; it projects from a sandy isthmus, and makes like an island. A small double islet, on which is the lighthouse, lies immediately to the N.W. of the cape, but with no channel between. The tides off this cape are rapid, and races frequent; it is therefore advisable to give the coast a berth of 3 or 4 miles.

Pandora Bank, of hard sand and seaweed, 6 miles S.W. by S. ½ S. of Cape Maria Van Diemen, frequently breaks heavily, and sometimes appears like a race, but not less than 5 fathoms has been found.

At 6 miles S.E. of Cape Maria Van Diemen commences the hard sandy beach, which extends in the same direction nearly 40 miles to Ahaipara; the only interruptions along its whole extent being the small rocky islet *Motu Pea* and Monganui Rocks; the former, 11 miles from the cape, is about half a mile from the beach, and 100 ft. high, but no channel inside. *Monganui*, a fishing retreat of the natives, is a rocky projection 15 or 20 ft. above the level of the sea, connected with the sands at low water, and is 6½ miles distant from Motu Pea.

Ahaipara Roadstead, at the extreme of the sandy beach just mentioned, affords no shelter from westerly winds. The approach is clear, and the anchorage is after bringing Reef Point (*Tau-roa*) to bear S.W.; the soundings will be found to decrease gradually from 10 fathoms.

Reef Point is a long projection, sloping down from hills chequered with sand; a spit of sand, which generally breaks, extends half a mile to the westward. The sea is said to be encroaching fast on this part of the coast.

FALSE HOKIANGA (*Herekino*) is 9 miles South of Reef Point, and 16 miles northward of Hokianga River; it is a small and dangerous harbour, with a swell always setting on the beach. No vessel drawing over 6 ft. should approach it, and then only in fine weather.

As strangers bound for Hokianga have frequently mistaken this harbour, it may not be amiss to remark that, in order to avoid this mistake, it must be kept in mind that the coast to the southward of Hokianga Harbour is bold and iron-bound, and that to the northward consists of a range of moderately high sand-hills, terminating in a range of mountains, extending to the South entrance of False Hokianga, but the coast on both sides of False Hokianga Harbour is very bold. The natives in this bay cultivate rather extensively, and have possessions and cultivations also at Hokianga, and no doubt if the entrance were better known, it would become an interesting and valuable place.

The caution given in the preceding paragraph was rendered much more essential from the fact that a native chief erected a flagstaff at its entrance similar to that at Hokianga. In 1839 the New Zealand Company's ship *Tory* was nearly lost here, and in 1846 H.M.S. *Osprey* was totally lost through this unfortunate mistake. The *Osprey* approached the coast in the latitude of Hokianga, March 10, 1846, but was obliged to stand off on account of the fog. On the following morning, on nearing the coast, a high southern headland was seen similar to that at Hokianga, with what was presumed to be the pilot's house, but which subsequently proved to be a white spot on the cliff. Soon afterwards a red flag was run up, and the brig stood in, bringing the North and South heads in one. She soon ran aground, and then came the alarming conviction that it was not the entrance of Hokianga, but that of *Herekino*, or False Hokianga. She became a total wreck, and some of her timbers remained for many years on the North entrance.

Wangape is a small port, 5 miles to the southward of False Hokianga, and is used by small vessels in fine weather; it has no bar, but there is a sunken rock in the channel, which is less than a quarter of a mile in width. The heads of Wangape are bold, and the land on either side is high, and continues so for 4 miles to the southward of the entrance, where the range terminates, and is succeeded by a sandy beach, backed by sand-hills, varying from 100 to 300 ft. high, and which extend nearly 8 miles to the North head of Hokianga River.

HOKIANGA RIVER, 12 miles from Wangape, is the northernmost port on the West coast accessible to ships of burthen. It flows in a north-easterly

direction for 20 miles between the wooded mountain ranges of Waima and Punghuru, whose steep sides approach the banks at distances varying from 4 to 10 miles, supplying the main river by large tributaries winding through valleys of great capabilities. Hokianga River is navigable, and has few obstructions for a distance of 15 miles from the heads, the depth in the channel varying from 4 to 26 fathoms, mud and sand, and the water is salt to its source.

Hokianga is the northernmost port of the West coast of North Island, and has its chief trade in the export of the celebrated Kauri pine and gum. Several mills have also been constructed for the manufacture of flax, and a new source of trade is the discovery of quicksilver deposits. Ships of 1,000 tons burthen can enter and load securely at the loading ground, in 5 fathoms water. Provisions and vegetables are plentiful. There is much doubt as to the permanence of any given mark or directions for entering the river; and, as is evident, any notice that might tend to mislead is worse than useless, we can only give the latest and most authentic information.

The result of the excellent survey made in H.M.S. *Pandora* (1851) showed that the bar extended direct across from N.W. to S.E. for 2 miles, at the distance of $1\frac{3}{4}$ mile from the heads, and was crossed in 16 ft. at low water springs. It is composed of dark green sand, with surface inequalities, and is a quarter of a mile in width. A fresh survey was made in 1878, by the officers of the S.S. *Stella*, under the orders of the New Zealand Government. The shoals forming the bar were found to be as formerly, with two channels, North and South, having a least depth of 18 ft. at low water spring tides. In the former main channel a depth of only 9 ft. was found. Monganui Bluff, in line with a low point about 6 miles S.E. of Outer South Head, leads close outside the bar shoals.

Andrew's Store, the southern house on the beach in Martin Bay, in line with the extreme of South Head, bearing E. $\frac{1}{4}$ N., leads through *North Channel*, and the Schoolhouse, a conspicuous single white building on the rising ground northward of the old Pilot's house, in line with the extreme of South Head, bearing N.E. $\frac{1}{2}$ E., leads through *South Channel*. Mariners should be guided by the signals on the South Head, especially the semaphore arm, as from the frequent changes of the bar, they are cautioned not to place reliance on the leading marks.

The shifting character of all these bars must be distinctly remembered, and no dependence whatever should be placed on any chart or directions of long standing. Without a pilot, or recent local knowledge, therefore, it will be very hazardous to attempt an entrance. What follows will be of a general character.

In approaching Hokianga River, a stranger should be confident of the latitude, for reason of the similarity which exists in some points between it and the small ports to the northward, and the possibility of being thus mistaken in

thick weather, as in the case of H.M.S. *Osprey*; neither should it be attempted unless with fine weather and a leading wind.

The entrance may be known by the North head of the river being the southern termination of a sandy range, which extends 8 miles to the northward, and is from 100 to 300 ft. high, while to the southward of it no sand hills are to be seen for a distance of 17 miles, or until passing Monganui Bluff, when the sand again commences.

Monganui Bluff is high land (2,046 ft.), falling abruptly to the water 17 miles southward of Hokianga River, and on a tolerably clear day will be seen from a vessel coming from the northward or westward long before reaching the entrance of the port. There is no high land like it on the coast, and it is a good mark to make at any time for vessels approaching Hokianga or Kaipara.

A constant swell from the westward breaks heavily on the beach, and the bar is always breaking; vessels should, therefore, be prepared for shipping a sea; three rollers generally are experienced before the bar is passed.

A vessel should be off the entrance, so as to carry the flood into the harbour; and about half-flood is the best time for crossing. Should the first of the ebb have made, and the bar appear passable, it must still be borne in mind that there is a tide of 5 knots to contend against, with the chance of the wind falling, as also that the anchorage between the bar and the heads is bad. Vessels should not attempt to cross the bar except with a leading wind and moderate weather, and never unless directions are signalled.

At the entrance between the heads there is a depth of 16 to 27 fathoms, but there are two dangers on the North side of the channel, which narrow it to $1\frac{1}{2}$ cable—these are *Nine-feet Rocks*, and a patch of 2 ft. off the North head; by keeping the South head on board, and the cliffs extending from it to Martin's Bay just open of the South head, these dangers will be avoided.

It must be remarked that the ebb tide sets directly on the South head spit, and in going out due allowance must be made for clearing it; several small vessels have drifted on this spit during light winds.

The *signal-mast*, painted white, is on the South head, which is 150 ft. high, and signals shown from it are described on page 349. The pilot boards off the South head, but seldom outside the bar.

Martin Bay is just within the South head, and has no dangers; the holding ground is good, but there is generally a considerable swell; it is, therefore, better, in entering, not to anchor until passing the Middle Ground. Vessels outward bound anchor here to wait an opportunity of crossing the bar.

Tides.—It is high water at the heads, on full and change days, at $9^h\ 45^m$; the tides run from 4 to 5 knots; ordinary springs rise 10 ft., and neaps 7 ft.; during strong westerly winds the neaps rise as high as ordinary springs, and sometimes have been known to rise 4 ft. above them. When inside the heads, the velocity of the stream decreases, being from 2 to 3 knots, until in the Narrows, where it is as much as 4 knots.

The banks of the river are everywhere approachable for boats at high water; at low water the mud flats, which commence 4 miles from the heads, are of considerable extent, generally soft, and very steep-to, and extending from point to point.

On the outer coast the flood runs to the southward, and the ebb to the northward. At the distance of 3 miles off shore the strength is 2 knots, and 1 knot at twice that distance.

From Hokianga River the coast continues its south-easterly trend; the land is moderately high, and the depth of water 2 miles from the shore is 20 fathoms. At the distance of 8 miles to the southward the coast becomes rocky, with large boulders, and continues so to Monganui Bluff.

Monganui Bluff.—This remarkable mountain, which is 17 miles from Hokianga, rises immediately over the sea to a height of 2,046 ft., and is thickly wooded; it is a conspicuous landmark, and can be distinguished a long distance from seaward; there is a break in the cliffs for 2 miles to the southward of it, when they again commence, and extend uninterruptedly in a straight line for 35 miles, or within 8 miles of the North head of Kaipara Harbour. These cliffs are topped with sandy hillocks, which reach but a short distance in-shore, and are backed by a range of moderate height, which extends the whole distance parallel with the coast.

At about 15 miles South of Hokianga the French frigate *Alcmène* ran ashore on the sandy beach, and was totally wrecked, in 1851.

KAIPARA HARBOUR is one of the most extensive inlets in New Zealand, and will probably become hereafter one of the most important. There are 700 miles of water frontage inside. The Kaipara district is admitted to be the richest and most extensive agricultural district in the colony.

It is stated that the first vessel which discovered the entrance into this port was the schooner *Fanny*, Capt. Wing, on January 6th, 1836, who, in entering the harbour, crossed the outer sand-bank, carrying 3 fathoms at high water, and worked out against a strong westerly wind by the middle channel. It had previously been supposed that there was no channel sufficiently deep to admit a vessel into this magnificent harbour. This is now accounted for by the fact, that there are two large sand-banks crossing the mouth of the harbour, extending beyond the headland on both sides, overlapping in the middle; and although one of these banks is at least 3 miles farther out to sea than the other, they appeared to be one continued shoal quite across.

Dr. Dieffenbach says:—"Kaipara is not a bar harbour, but a channel harbour; it is a large basin, into which a tide, rising 10 ft. at full and change, rushes with great velocity, which, joined with the narrowness of the channel, and our imperfect knowledge of the soundings, certainly occasions great danger. Westerly winds, which blow without intermission during some portion of the year, and increase the current setting into the harbour, are another inconve-

nience, as they prevent ships leaving the harbour at all times. This, indeed, is the case with all harbours on the western coast of New Zealand."

Kaipara Entrance differs from Hokianga River entrance in this respect, that instead of a continuous bar across, which can only be passed by large vessels at a certain time of tide, it has a succession of sand-banks, with several (*shifting*) channels between.

In consequence of there being no distinctive features in the neighbourhood, with the exception of the beacons on the heads, the entrance of the port is not easily made out by a stranger. The best natural marks for the entrance are, that the sand-hills at the North head, which are 490 ft. high, are 200 ft. higher than those along the beach, and have three green hillocks on their face; and that the sandy cliffs recede from the beach for some distance to the northward of the entrance.

The land South of Kaipara Harbour is also higher than that to the northward, and a large triangular tuft, named *Puki-tu*, will be observed on the summit of a sandy ridge 430 ft. high, 2 miles from the beach line, South of the South head; moreover, in clear weather, the opening shows the dark hills on the eastern shores of the river's mouth.

The breakers, however, will generally be seen from the mast-head long before the distinctions in the land are visible, their south-eastern limit being 6 miles from the North head, and those at the main channel entrance 4½ miles from the South head. The whole extent of the outer limit of the breakers is 11 miles, encircling the mouth of the port in the form of a crescent convex to seaward.

On North Sand Head are two *beacons*, which brought in line N.E. ½ N. lead through Kemp Channel; the upper is triangular and painted black, the lower is a small house painted dark red. There is also a *Semaphore* flagstaff seaward of the beacons, on which the signals, page 349, are shown. The beacons and flagstaff are only visible about 4 or 5 miles from seaward.

It is impossible to give any account of the different entrances across this line of sand-banks which can be acted on for any length of time, and therefore it would be worse than useless to do so. In 1852 Capt. Drury found in the survey that there were four channels—*North Channel*, lying close along the North shore, with 2¼ to 3 fathoms, narrow and difficult; *Fanny Channel*, then thought to have opened recently, and leading directly towards the North head, with 15 feet water; *Main Channel*, 4 miles from the beach, at the South head, and three-quarters of a mile wide in its narrowest part, with 5½ fathoms at low water in mid-channel; *South Channel* was narrow, intricate, and not well known.

In 1856 this was altered, and *Kemp* or *Galatea Channel* was announced by Capt. J. Kemp, of the barque *Galatea*. This channel was examined in 1878, when North Channel was found to be completely blocked up, and it is doubtful if either Main or Fanny Channels exist. The outer edge of the bar of the N.E.

or Kemp Channel had shifted about 1½ mile seaward, and the least depth on it was 5½ fathoms at low water springs. Inside the bar the depth continues to be 6 or 7 fathoms for 1¾ mile, when it gradually deepens to 23 fathoms between Tory Shoal and North Spit, where it is only three-quarters of a mile wide, these banks having extended.

To enter, bring Puki-tu to bear E. by N., and proceed on that course until the middle green hillock on North Sand Head bears N.E. ½ N., when a conspicuous conical hill called *Wakahuranga*, bearing N.E., distant 10 miles from North Sand Head, will appear just open East of North Sand Head: from this position steer N.E. ½ N., with the beacon, house, and semaphore flagstaff (all standing behind the middle green patch on North Sand Head) in line until Puki-tu bears E.S.E., when Wakahuranga will appear immediately over North Sand Head; a vessel will then be guided by the semaphore, steering in the direction towards which the arm points, and steadying the course when it is dropped. If the signals are not seen, a vessel should keep from a quarter to half a mile off the northern shore until abreast the semaphore station, when a course may be steered for either Kaipara or Wairoa Rivers. On approaching Tory Shoal, keep about 3 cables from the North beach as far as Pouto Point, where the pilot must be taken. A *buoy* is placed off the end of the spit forming the North side of Tapora Channel, and about a mile South of Pouto Point is another *buoy* marking a shoal, lately formed, nearly dry at low water, and extending 1½ mile E.N.E. from the buoy.

Both ebb and flood streams set slightly towards the North shore of Kemp Channel; great care should therefore be exercised when beating, or in light winds.

There is one drawback to a stranger in making out the port, that is the vapour, or haze, which constantly hangs over the banks, impeding the view, which is no doubt caused by the commotion of the sea, but the breakers are the best mark, if made to the North of the port.

From what is said above, it is most evident that no dependance can be placed on the permanent direction of any of the channels. Therefore, all caution should be used, and Capt. Drury urges the necessity of approaching the channels and passing through them by piloting from aloft.

Inner Channels.—At 5 miles within the heads three large rivers branch off in different directions, winding through some of the most fertile land in New Zealand, abounding with the kauri and other valuable timber, and well adapted to agricultural purposes. These rivers are navigable for many miles for vessels of large tonnage.

The northern branch, the *Wairoa*, is full of shifting sand-banks, with a channel between for vessels drawing 18 to 19 ft. water for a distance of 38 miles, and small vessels for 70 miles. *Pouto Point*, off which a spit extends half a mile to the southward, is on the North shore of the estuary, 6 miles within the entrance points, and forms the turning point into the Wairoa River.

At 2½ miles above it is an anchorage off the watering place; from this anchorage a pilot is required, and will be obtained from the native village of Okaru, 3 miles above the watering place.

Otamatea, the eastern branch, traverses the whole breadth of the island, one of its arms almost reaching the River Wangari, on the eastern coast, and has deep water for a distance of 25 miles; small vessels go 10 miles farther. *Arapawa*, a branch of the Otamatea, is a fine deep river up to Makakohae Creek. There are deep channels from the heads of Kaipara Harbour into Otamatea River, but until buoyed they should not be taken without a pilot.

Kaipara, the southern branch, flows through a valley formed by the hills, which bound the coast between Kaipara and Manukau Harbours, and is only separated from an inlet of Auckland Harbour by a distance of about 3 miles. Over this piece of land from Riverhead settlement, a road and a railway are made to *Helensville*, a rising township, containing 326 inhabitants in 1881. To anchor in the Kaipara branch, have passed between the heads, keep the southern shore rather on board until 2½ miles beyond the first headland, a red cliff. Anchor in this position half a mile off shore in an open bay before reaching Omokoiti, the largest native settlement in the Kaipara. Above this the channel of the river passes between mud-banks, best navigated at low water.

It is high water, on full and change, at the heads of Kaipara Harbour, at $10^h\ 55^m$; springs rise 10 ft., and neaps 8 ft. In the principal channel the tide runs 4 knots. The tides vary in strength according to winds and freshes. They are the strongest between Tory Shoal and North Spit; and off the North entrance, until reaching the first white cliffs in the Wairoa, when the influence of the Otamotea and Oruawharu Rivers may be said to cease. The ordinary springs in these parts run 5 knots, but during freshes and strong gales 6, and even 7 knots.

The tides outside follow the direction of the coast, the flood running South and the ebb North, but on striking the outer banks they flow and ebb directly over them, as well as through the channels. The set of the tides must be attended to in navigating these channels, and a vessel should not stand far into the great semicircular bight inside the banks with the ebb, or she will be carried on them; but, unless in cases of emergency, vessels should not anchor outside the heads.

The tides of the river follow the courses of the channels. Vessels leaving Kaipara Harbour should be within 3 miles of the heads at the first of the ebb, if it is intended to beat through, which is possible for a smart working ship to do. If a fair wind is considered necessary, it must remembered that the morning land wind will rarely carry a vessel clear of danger, and will probably leave her becalmed among the breakers.

From KAIPARA to MANUKAU HARBOUR, a distance of 40 miles, the coast is almost straight, and free from dangers, but no landing can be effected

on any part of it. *Rangitera Beach*, a hard sand, fringed with low undulating sand-hills, extends for the first 24 miles South of Kaipara.

The small island *Oaia* lies at the southern end of this beach, about half a mile off shore, and from it to Manukau Harbour the coast is rugged and cliffy. The cliffs for 5 miles northward of the entrance are from 600 to 800 ft. high, and 2 miles from the North head is a remarkable conical peak (*Ohako*) close to the sea; 1½ mile North of Ohako Cone is *Parera*, a small rock lying half a mile off shore. The coast immediately southward of Parera is fronted by a shoal, which extends a mile off, and is continually breaking.

Vessels running along the coast from the northward for Manukau should keep 4 miles off shore until the marks are on for entering, as the banks extend 3 miles off the mouth of the harbour.

MANUKAU HARBOUR is an extensive inlet, running from the entrance for about 17 miles to the flourishing town of Onehunga, presently described, which is situated at the head of the inlet in its N.E. part. Another large bay diverging into several smaller inlets, runs to the S.E. for 20 miles, making its breadth in this direction 11 or 12 miles.

It is a singular change, after passing the rugged and narrow entrance, to pass into the broad expanse of the harbour. The channel through this basin we cannot describe, as it must be left to pilotage. The northern shore is (or was) more or less covered with the Kauri forest, in some parts a complete jungle. It is remarkable that this tree does not grow to the southward of the harbour. Spars and planks may be got.

Part of the shore, at its head, is strewed over with hard basaltic lava and scoriæ, and it is not difficult to point out, in a cove on the southern shore, the source of this volcanic produce. The northern shore is cliffy, and consists of stratified greyish sandstone, or sandstone conglomerate. The stratifications of the latter are sometimes curvilinear. The cliffs are covered with various trees, but this vegetation is nearly confined to the West, as the land which extends from the North shore of Manukau is not covered with anything of higher growth than fern, rushes, &c.

The North head of Manukau is formed by three rugged conical hills. Inside the outer head the coast presents a bold rocky precipice, alternating with small secluded bays; but a vigorous vegetation covers them to the water's edge, and kauri trees have grown in places where the precipice is inaccessible on account of its rapid declivity. About 5 miles from the outer headland the northern side of the entrance forms the Peninsula of Puponga, projecting a mile to the S.E.; and round this inner headland, close in-shore, is the best anchorage in the harbour, perfectly sheltered from the N.W. and S.W. winds. A swell, which would be liable to set in from the harbour itself, is broken by a long sand-bank occupying the centre of the basin.

The southern shore of the harbour consists of undulating and fertile land, which extends from Onehunga towards the Wai-kato. There is a second

channel on that side of the harbour; and a channel for boats extends towards an arm of the Wai-kato River, the *Awaroa*, with a very easy portage of 2½ miles.

Manukau, in common with the other harbours on the West coast of New Zealand, has a bad reputation, which is corroborated by the fact that no insurance could be effected for it. One of the most melancholy circumstances connected with it is the loss of H.M.S. *Orpheus*, on the bar of the main channel, on February 7th, 1863, by which, out of a crew of 260, only 70 were saved. This almost inexplicable affair occurred at noon of a fine day, and exactly on the line of direction given as the entering mark in the Directions of 1859; subsequently to which it was ascertained that the bar had shifted to the northward (of which the ship was apprised). She became a total wreck on this South bank, on a spot where deep water was still marked on the Admiralty chart she used. It is needless here to animadvert or dilate on this fearful catastrophe, beyond urging the *caution* which such a calamity ought to induce.

For this reason the leading marks here given may not be long correct. The seaman's skill and sagacity must supply their place. What follows is from the latest official directions and descriptions.

No stranger should attempt to enter Manukau without having first made out the signal station on the South head, when every attention should be paid to the signals (p. 419), only made for the South channel, as the smooth water can be seen better from the signal-station than from the ship. Pilots do not proceed outside the bar, but board vessels when off the South head.

Entrance.—The heads are easily distinguished, the coast gradually increasing in elevation from Kaipara to Manukau, where the hills on the North shore rise to the height of 1,280 ft. To the North of the port the country is an extensive forest, while all that facing seaward to the southward is peculiarly barren for 20 miles; but the most conspicuous objects first visible from the westward are the three conical peaks near the North head. One of them forms the island Paratutai, and may be considered as the North head, being connected at low water; it is 335 ft. above the sea; about three-quarters of a mile from it, inside the harbour, on the side of the hill, North side of entrance, are three white *beacons*, 43 ft. high, which are steering marks for the South channel. The South head presents a rounded barren face of brown soil, with table land extending southward. There are six white *beacons* on the South head, erected as leading marks for the South channel, but they are no longer of use, the channel having shifted.

Light.—On the brow of the South head bluff, from a tower 20 ft. high, nearly the same colour as the surrounding land, a *fixed bright* light is exhibited at an elevation of 385 ft. above the level of the sea, visible from seaward between the bearings of N. by W. ¼ W. and E. by S. ½ S., and should be seen in clear weather a distance of 26 miles.

From its great elevation, it is at times seen at great distances, but it is only meant for vessels accustomed to trade along the coast. It is not intended to encourage strangers to attempt the entrance by night, nor yet to approach the coast. Great caution is requisite in approaching it, as in foggy weather its visibility is much lessened.

Channels.– Manukau had three different channels, viz., North, Main, and South. In 1878, there were two, the Main and South; a large ship could only enter by the Main Channel, but owing to the want of leading marks, and the distance of the entrance from the signal-staff, the *South* or *Fanny Channel*, on the N.W. side of Treachery Shoal, is now the only one used. In it the least water found was 13 ft.; the tides are strong, and the channel shifts after strong S.W. gales; buoys have been laid down, but their position cannot be relied on.

Vessels going in or out should pay particular attention to steering, by keeping the vessel in the direction in which the semaphore arm on the signal-staff points, and steadying the helm the moment the arm drops. Vessels making for the South channel should bring the South head to bear N.E. by N. ½ N., running on that course until the signal mast is made out; then the course steered should be as directed by the semaphore arm, until the three beacons on the North side of the entrance are brought in line. The course must then be sharply altered and care taken to keep them in line till the harbour is well open. The pilot, if necessary, will board inside the entrance; should there be no pilot, and bound to Onehunga, keep the red buoys on the starboard, and black on the port hand.

Main Channel.—The bar of the main channel, a cable in breadth, is 3 miles from Paratutai; the least water at low water springs was 21 ft. in the channel on the bar. The soundings from seaward to the bar decrease very gradually to 12 fathoms, which will be found on the outer edge; and from that depth it shoals suddenly, increasing again with from 7 to 17 fathoms.

The natural marks for leading into Manukau Harbour are very conspicuous; the *Ninepin*, a rock 80 ft. high, near the low-water extreme of the North head, *Paratutai;* a third rounded point, *Puponga*, the extreme of a peninsula, projects from the North shore 5 miles inside the harbour. But from the shifting nature of all the bar harbours on the West coast of North Island, the seaman is *cautioned* to pay strict attention to directions that may be given from the pilot station, and it has been recommended as a general rule, in the absence of direct information of change in the channels, that that portion which has the smoothest water between the breakers should be taken, as experience has proved that it will be the deepest part.

The leading mark used in 1864 was Ninepin Rock, in line with the tangent of the inner point of the South head, but as there is the same depth, viz., 3½ fathoms a little to the northward, and the banks have a tendency to extend

themselves yet more in that direction, it would be better to bring Ninepin Rock in line either with a projection, half way up the slope (Nib), or with the inner part of the Sand Cliff on South head for crossing the bar.

When inside the South spit or outer middle bank bring Puponga Point open of Paratutai, steering along the middle banks to avoid Orwell Shoal, which runs about a mile W.S.W. The dangers are plainly seen on both sides of the channel, except at high water, during a long continuation of fine easterly weather.

Pass a cable from the Ninepin to avoid a sand-spit, which extends to the S.W. of it; but when it bears North, steer for and keep as near to Paratutai as convenient.

It is high water at the entrance of the Manukau, on full and change of the moon, at $9^h\ 30^m$; springs rise 13 ft.; neaps 10 ft. The flood comes from the northward, setting along shore from 1 to 2 knots, but when coming in contact with the banks about the *bar*, it trends into the *channels*, increasing its rate to 4 and 5 knots as it approaches the heads.

The following remarks are by Mr. Wing, pilot and harbour master, made during an experience of over a quarter of a century :—

" Care should be taken to guard against the cross-tides about the spits and swatchways.

" The prevailing winds are from N.W. to S.W., and it seldom blows a gale from the southward, the wind moderating as it draws from S.W. to southward. Easterly gales are not frequent, and generally shift suddenly to the westward, in a violent squall and very heavy rain. The gales rarely continue long in one quarter, and a strong breeze from N.W. or even W.S.W. (as a rule) does not cause a heavy sea in the South channel, which can be taken with safety towards high water.

" The bar, with such winds, generally speaking, breaks, and dangerously, towards low water; but in case the gale gets to the S.W. the sea will break right across both channels, but less across the South channel, which is never at any time so dangerous as the main channel. This, however, is of short duration, and seldom lasts over a day and a night, when by the morning it becomes moderate, and the South channel free of break (even though there be considerable swell outside and the banks breaking heavily), and safe to enter at proper time of tide, say at half flood, or even at first quarter ebb, with a commanding breeze or steam."

The channels were marked by buoys and beacons, the *red* buoys and beacons being on the starboard side, and the *black* buoys on the port side of the channel, going inwards. Mariners are cautioned to place no dependence on the buoys, as they frequently break adrift, or are removed, and to exercise the greatest care in entering, attending strictly to the steering signals from the pilot station, and keeping the lead constantly going. Sailing vessels should

not attempt to enter Manukau Harbour against the strength of the ebb, unless with a commanding breeze.

None but those thoroughly acquainted with the local signals should attempt to cross the bar of Manukau Harbour.

Signals.—The following local signals for Manukau Harbour were approved by the New Zealand Government, in December, 1873, and supersede those formerly in use:—

1. One ball at mast-head.—*Wait for flood-tide.*
2. One ball at mast-head, and North semaphore arm pointed up—*Wait for half flood.*
3. One ball at mast-head, with both semaphore arms pointed up—*Wait for high water.*
4. One ball at each yard-arm—*Steam-vessels take South Channel.*
5. Two balls vertical at South yard-arm, and one at North yard-arm—*Sailing-vessels take South Channel.*
6. When the ball at North yard-arm is lowered halfway down in connection with signal for steam or sailing vessel, it will mean—*Take Fanny Channel* (?).
7. One ball at mast-head, and at each yard-arm—*Bar dangerous.*
8. Both semaphore arms pointed down—*No wind about the heads.*
9. North semaphore arm pointed horizontally, and South arm downwards—*Come to an anchor.*
10. Both semaphore arms pointed upwards—*Remain at anchor*, or *Wait for signal.*
11. South semaphore arm pointed upwards, and North arm downwards—*Will send a pilot.*
12. Both semaphore arms pointed horizontally—*Get under weigh.*
13. North semaphore arm pointed up, and one ball at North yard-arm—*A vessel in danger and wanting assistance.*
14. Both semaphore arms pointed up, and a ball at each yard-yarm—*A steamer is coming to your assistance.*
15. When the signals are intended for vessels OUTWARD BOUND, an *extra signal* in the form of T, painted *red*, will be shown below the yard on the mast.
16. The semaphore arms will be used for piloting vessels in and out of the harbour when required. The vessel being piloted by the semaphore is to be steered in the direction in which the semaphore arm is pointed; and when the arm is dropped, the vessel is to be kept steady as she goes.

The general signals are described on page 349.

Inner Channels.—Above Puponga, the inner North point or peninsula, the harbour has three channels navigable for vessels of the largest class to three respective districts of great importance, Onehunga, Papakura, and Wai-uku. These channels generally are nearly straight, and at low water the banks are dry on either side of them; they offer shelter and anchorage. One tide will suffice to carry a vessel from the heads to any of these districts.

Onehunga Middle or *Main Channel*, also called *Wairopa Channel*, leads along the North shore from Puponga Point; it is well buoyed, and the red

conical buoys should be left on the starboard hand entering, the black buoys on the port hand. At 5 miles within its entrance the channel divides in two at Shag Point, and joins again off Cape Horn $2\frac{3}{4}$ miles below Onehunga. The inner or western branch is to be avoided, as it becomes difficult just before reaching Cape Horn.

Another channel to Onehunga, called the *Outer Onehunga Channel*, comes up direct from Puponga Point, and would have been the best channel to Onehunga, but that it fails in depth where it enters the main channel at Cape Horn. It is useful to the lands around Puketutu, and indeed is generally available, as it would have 22 ft. at high water, where it is most difficult.

ONEHUNGA is a port of entry, about 6 miles South of Auckland by land, and has an increasing population, numbering 2,217 in 1881. There is a fine level macadamised road, bordered by substantially fenced farms, handsome suburban villas, and market gardens, leading from Auckland to Onehunga. The railway from Auckland to the Waikato country passes this town, which promises to become a very important commercial and shipping port, as it is found that steamers can reach Sydney or Melbourne in a shorter time, sailing from the Manukau than from Auckland, or any of the southern ports, and having in its vicinity iron-sand, ironstone, and coal in great abundance. The facilities afforded by the railway will rapidly increase the business and manufactures of Onehunga.

Papakura Channel, cutting through the middle of the flats, runs to the eastward for 12 miles. It has from 8 to 10 fathoms for the first 3 miles, and not less than 4 fathoms to within the heads, where there is anchorage in $4\frac{1}{2}$ fathoms. Extensive coal fields exist at the head of this channel, which the intercolonial steam vessels avail themselves of.

Drury, a township named after Capt. Byron Drury, R.N., whose surveys have been of much benefit here, is pleasantly situated at the foot of a range of noble hills at the head of Papakura Channel; the railway from Auckland passes through it. Near it is the *coal mine* of the Waihoihoi Coal Company, which, however, has some difficulties to contend with from the transport to Slippery Creek, $3\frac{1}{4}$ miles from the mine. According to Dr. Hochsetter, of the Austrian discovery ship the *Novara*, the coal is a lignite, equal to the best cannel coal of Germany, most useful for fuel and manufactures, but too bulky for steam vessels for long voyages.

Waiuku Channel, commencing from Te-Hopono Point, opposite to Puponga, runs along the shore to the southward. Vessels drawing 12 ft. may go up as far as the narrows, which are $10\frac{1}{2}$ miles above that point. The Taihiki, a tributary of the Waiuku, 7 miles within Te-Hopono, is navigable for vessels drawing 12 ft. for 2 miles. The channel up the Waiuku is along the coast, and it is generally steep from point to point.

WAI-KATO RIVER, 22 miles S.E. $\frac{1}{2}$ S. from Manukau, is the outlet of one of the largest rivers of New Zealand. It has a narrow channel, where, at low

water, only vessels of about 30 tons can enter. But inside the headlands the Wai-kato is a stately stream; and, when the tide has increased its depth, it is navigable even for larger vessels for about 60 or 70 miles, where it is joined by the Waipa, which is navigable for boats 60 miles further.

The left or South shore of the Wai-kato consists, for about 8 miles from the sea, of shifting sand; the right shore is hilly, and at the foot of the hills, near the embouchure of the river, is the station of the Church Missionary Society, *Maraenui*, established about the year 1840. A mountain (Terua-tui-tui) 1,230 feet high, lies N.E. by E. 4½ miles from the entrance.

When near the Wai-kato, do not shut in Oruaranghi Point (3 miles southward of the entrance) until the white Fairway beacons in one, bear N.E. by E. ½ E., easterly; then proceed over the bar with them in line. The beacons are 25 ft. high, and 200 ft. apart, standing on the North bank. When just over the bar, the water will deepen 5 or 6 ft. Keep the marks on until a sandy cliff on the South head is about to shut in, when steer for Putataka. When the Mission House is touching a yellow cliff on the West side of Putataka, see that the small black beacons are still open, to avoid the 5-ft. bank to the northward of the channel.

If wishing to bring up to the eastward of Putataka, anchor so as to swing clear of a 4-ft. rock, E. by N., 1 cable from the point, and the shoal water to the northward of the channel. If a vessel is 150 ft. long, she must moor, but can lie at single anchor to the N.W. of the point. The tide is less strong to the eastward of the point.

In going out from Putataka, steer down for the mouth of the river, keeping the black beacons open to avoid the 5-ft. bank. Bring the Fairway beacons in line when the sandy cliff is about to open itself, and proceed across the bar. Keep the marks on until Oruaranghi Point is well open, when you are clear of the breakers at the entrance.

The least water on the bar, with the Fairway beacons in line, is 12½ ft. at low water spring tides; but there is 10 ft. a short distance to the northward, and 11 ft. the same to the southward, so that the marks should not be opened much.

The beacons when in line appear in the middle of an easily recognized gully. The eastern beacon is on White Shell summit: the western, a quarter of a mile S.W. by W. ½ W. from it, on a little mound.

The spits at the entrance appear to have shifted since Captain Drury surveyed the Wai-kato, as the present Fairway magnetic bearing differs 4° or nearly half a point from the old one.

From Wai-kato River the coast trends S.E. by S. ½ S. for 20 miles to Whaingaroa Harbour. The only off-lying danger is Kopiapia Rock, a black rock, about 20 ft. high, lying a mile off the coast, 7 miles southward of the South head of Wai-kato.

WHAINGAROA HARBOUR, or Port Raglan, from a town of that name

established on its South shore, may be known by *Karehoe Mountain*, of conical shape, rising immediately over *Woody Head*, the outer South entrance head, to a height of 2,370 ft. It is an excellent landmark. Opposite the township are five limestone rocks, which will ultimately become valuable. Timber for building purposes is to be got, and ironstone exists in the mountain. Coal is reported to exist a few miles inland.

The harbour is just to the northward of the mountain, in a bight formed between it and the land running towards Wai-kato. When the bight is made, the entrance will be distinguished by a reddish cliff hill over the South head; the North head is low and sandy, with high woody land behind; the South point is also low, but not sandy, and slopes down from the reddish cliff hill just mentioned.

The bar is a mile outside the entrance, which is formed by two spits, dry nearly halfway out at low water, the passage between them being 2 cables wide. The marks for crossing it were, in 1866, a large white house in the town, its own breadth open of Rangitoto Point, or the two beacons on Ann Point in one, which lead in on an E.N.E. course; these marks lead over the bar in 3 fathoms at high water. Ann Point gradually slopes from a low hill 2½ miles inside the entrance. The beacons are painted *red*, one being higher than the other, and are posts with barrels on them.

In approaching Whaingaroa, the water shoals regularly from 8 fathoms, 2 miles off, to 9 ft., which is the least depth on the bar at low water springs. The channel is sometimes strait in from the bar to the heads, carrying in 2, 3, 4, and 5 fathoms, when between them. Vessels may sail up to where the harbour branches off into the Whaingaroa and Waite-tuna Rivers, which are 3 miles from the entrance.

It is high water, on full and change, on the bar at $9^h\ 50^m$; rise 12 ft. The tide runs 4 to 6 knots between the heads.

Gannet Island, so named by Cook, is a small island about half a mile in circumference, white with guano, and 70 ft. high, with rocks extending a quarter of a mile to the S.W. of it; it bears S.W. ½ S. 13½ miles from Woody Head, and N.W. ¼ W., 11¼ miles from Albatross Point.

AOTEA HARBOUR.—From Woody Head the coast trends nearly South; the country hilly and wooded to Aotea Harbour, 10½ miles to the southward of Woody Head. From seaward the entrance has the appearance of a great gap, with sand-hills on either side. The South point, Kapua-te-mauna, has a darker summit than the rest of the hills on the coast, and is 380 ft. high.

Off the North head, and a mile from the land, are two rocks; the northern (*Ewhatu*) is awash at low water, and nearly always breaking. It bears from the North head W. ¾ N., and from the bar N.W. by N., 1½ mile from either. The South rock, which seldom breaks, is a quarter of a mile South of Ewhatu. There is deep water round and between them.

The width between the heads at high water is three-quarters of a mile, but

from the North head a long sand-spit, dry at half-tide, runs to the southward for 1 mile; and half a mile southward of the South head the South spit runs off, and outlies the North one, drying at low water about one-third of a mile out. Like the other sand-bars hereabout they shift, and no safe directions can be given. At the time of the survey, in 1854, the direction across the bar was E. $\frac{3}{4}$ N., in 11 ft., at low water.

KAWHIA HARBOUR, 5 miles South of Aotea Harbour, is the most considerable inlet on the West coast, South of Manukau Harbour. The approach to it is well marked from seaward by the distant mountains of *Pironghia*, which rise in notched summits, 15 miles inland, to the height of 2,800 ft., also by the high wooded headland to the northward, Woody Head, as well as by the bold craggy land of Albatross Point on the South side, which extends 5 miles to the westward of the port, and forms the bight in which it lies.

The harbour bears from Gannet Island E.S.E. 13 miles distant. It has a bar entrance, which is $1\frac{1}{4}$ mile distant W.N.W. from the heads. At the time of the survey, in 1854, there were two channels in—the North and South—which are separated from each other by a bank nearly half a mile in extent, with less than a fathom on it at low water. The South channel was the best and deepest, being nearly 2 cables wide, with 14 ft. in it at low water (direction across the bar, first E.S.E., and then E. by S. $\frac{3}{4}$ S., in 1854); the northern not so wide, and only carries 11 ft. over it; moreover, in westerly winds there is a heavy abeam sea in crossing it (direction, S.E. $\frac{1}{4}$ E., in 1854).

Albatross Point, 5 miles westward of Kawhia entrance, is 600 ft. high, bare and cliffy to seaward, having detached rocks within a cable's length. During S.W. winds, and with the ebb tide, there is a great sea off this point, and vessels bound to or from Kawhia should give it a berth; between it and New Plymouth, an extent of 70 miles of coast, there is no place of shelter, except the small rivers *Mokau* and *Waitera*, which are alone eligible for coasters in fine weather.

Mokau River.—This river, which takes its rise in the Rangitoto mountain range, is resorted to by coasters engaged in the native trade. It has only 2 ft. water over its bar at low water springs, and at high water 14 ft. Vessels of 20 tons cross it under favourable circumstances, and there is good anchorage within. It is navigable for boats for many miles, but is subject to heavy freshes. Coal is found here. The *White Bluff* (Parinini), a very remarkable cliff, 900 ft. high, and visible a long distance from seaward, lies 10 miles South of Mokau River.

Waitera River is 8 miles north-eastward of New Plymouth, and is often run for by coasting vessels on the approach of bad weather at that roadstead, as well as for the purposes of trade with the natives. There is not more than 2 ft. of water on its bar at low springs, but the tide ranges 12 ft. The anchorage is off the native village, a quarter of a mile within the entrance, in 3 or 4 fathoms. The river is navigable for boats a distance of 4 miles.

Night Signals.—Two *red* lights, vertical, signifies take the bar; two lights vertical, *red* over *bright*, signifies bar dangerous. From vessel, two bright lights horizontal with one *red* over, forming a triangle, signifies, want to come in before daylight. Vessels approaching New Plymouth, or Waitera, at night, requiring a pilot, should fire a gun, and burn blue lights.

NEW PLYMOUTH, a settlement formed by an English company, which merged into the New Zealand Company, in May, 1841, was selected in February, 1840, by Mr. F. Carrington. The roadstead was to be called Port Elost. The town and district of Taranaki, the garden of New Zealand, has not flourished like other parts, perhaps from the native troubles, and the want of a good harbour. To remedy the latter defect, extensive works have been in progress for forming a harbour. The European population of New Plymouth and its surroundings was 3,310 in 1881, mostly employed in agricultural pursuits. New Plymouth is connected with Wellington and Port Napier, partly by railway and partly by coach.

The settlement of (Taranaki, or) New Plymouth is strikingly marked from seaward by the group of Sugar-loaf Isles, fronting it westwardly, and by its proximity to that snow-capped and Alpine-featured peak, *Mount Egmont*, presently described.

Light.—The settlement flagstaff, from which a *fixed red* light is shown, elevated 75 feet above the sea, is immediately above the landing place, and close to the occupied portion of the town site. From it Mount Egmont bears S. 1° 12′ W., *true*, 14·45 miles, and Moturoa, the highest of the Sugar-loaf Islands, N. 77° 43′ W., 2·05 miles. The light is obscured by the islands, from the bearing seaward W. by S., to the land.

The roadstead extends from the Sugar-loaf Islands to a line North of the flagstaff. At an average distance of 1¼ mile from the shore there is an uniform depth of from 10 to 12 fathoms. It is, however, not prudent for vessels of any size beyond coasting craft to come within this depth, as the bottom becomes very foul, with a reef and an irregularly attached rocky ledge extending out a long half mile from the shore, a short distance westward of the flagstaff. Its eastern edge lies W.N.W., and its North extreme N.W. ½ N. from the flagstaff, and N.E. by E. ¾ E. from Motu-roa. The reef and ledge break in moderate weather, and shelter the landing place from the prevalent S.W. winds and swell.

The best anchorage is in 12 fathoms at low water, with the Wesleyan Mission school, a remarkable building standing on elevated ground midway between the town and Sugar-loaf Islands, in a line with Mount Egmont bearing S. by E. ¾ E.; and Seal Rock midway between the two large Sugar-loaf Islands, bearing S.W. ½ S. The flagstaff will then bear S.E. by E. ½ E., distant 1¾ mile.

The anchorage now used by trading vessels of all classes extends along a line bearing N. ½ W. from the flagstaff on Mount Elliot (a slight elevation behind the boat sheds). Large vessels anchor from 1 mile to 1¼ mile from the shore in 8 to 9 fathoms, sand and rocks, the flagstaff bearing S. ½ E. The

roadstead is open to all winds from S.W. round by North to E.N.E. (eighteen points of the compass).

From the centre of a shoal of 17 ft., off the landing place in the eastern part of the roadstead, the flagstaff, distant half a mile, is in line with a farm house in the centre of a clump of trees, bearing S. ¼ E.; and the two white beacons on the sand hills westward of the landing place are in line bearing S.W. by S. These beacons in line lead over the shoal, and kept open will lead clear on either side.

Moorings capable of holding vessels of 200 tons are laid down at about a mile from the shore, and marked by a large buoy. Care must be taken not to anchor too near these moorings, which lie N.E. and S.W., with 60 fathoms each way, and have a depth of 7 fathoms at low water springs; there are other buoys further in. At about half a mile from the shore is a buoy in 4 fathoms, marking the anchorage for steamers and small vessels.

A vessel from the westward bound for New Plymouth should make the outer Sugar-loaf Island, and when it bears South 1 mile distant steer E.S.E. until the same island bears W.S.W.; keep it on that bearing until the small white flagstaff on the beach, in front of the boat sheds, comes on with the flagstaff on Mount Elliot, bearing S. ½ E.; the vessel will then be close to the outer mooring buoy. A vessel from the northward, with a fair wind, may run for the flagstaff on Mount Elliot when bearing S. ½ E., continuing on this course until the outer Sugar-loaf bears W.S.W., which will bring her near the outer mooring buoy.

If working to windward from North or N.E., do not approach the coast eastward of the anchorage nearer than the depth of 7 fathoms, to avoid the reefs which extend in places to a distance of a mile from the shore for 15 miles eastward of New Plymouth.

The general nature of the bottom appears to be rocky ledges, covered with a thin coating of dark coloured sand, but North of the settlement it is strewed with large boulders and shingle. Vessels often experience a difficulty in weighing, caused by the foul ground below the sand. A stout crown rope to ensure canting the anchor should always be employed. There is at all times a swell in the roads, and a vessel should leave with the first symptom of an on-shore wind, and therefore be prepared to slip. For this purpose it is better to use chain for the slip buoy, as the foul ground would be likely to cut rope. If obliged to slip, and the wind is N.N.W. or eastward of that point, fill on the starboard tack; but if to the westward of N.N.W. slip on the port tack, and carry as much sail as the vessel will bear. It is necessary to ensure casting the right way.

Winds.—Should the wind veer to N.W. from S.W., through West, it may be looked on as certain that a strong on-shore wind will set in within 24 hours, however fine the weather may be when the change takes place. In the event

of having been obliged to slip, masters of vessels can obtain information of the state of the anchorage by closing the outer Sugar-loaf, when the harbour master will inform them by signal what to do, vessels having often kept to sea in a strong S.W. wind when there has been good working weather in the anchorage.

In addition to the general harbour signals, described on page 349, and those local signals described with the description of Timaru Harbour, the following night signals are used at New Plymouth:—From the shore: Two *red* lights vertical—A boat will come off. From the vessel: Two *bright* lights horizontal with one *red* over, forming a triangle—A pilot wanted.

The two lights on the shore will appear vertical, when a vessel is in the line of anchorage, the flagstaff bearing S. ½ E., the lowest light most seaward.

SUGAR-LOAF ISLANDS (*Nga-Motu*) are a remarkable and appropriately named group; the most lofty and striking of these (*Paretutu*) rises from a low point of the adjacent main as a sharp cone, to an elevation of 503 ft. The inner islet (*Motu-roa*) is similar in character, and 266 ft. high; whilst the outer (*Motuo-mahanga*) is saddle-backed, with a conical summit 190 ft. high. There is a deep passage between these islands, avoiding Barrett Reef (a half-tide rock), lying half a mile westward of Motu-roa, and passing on either hand of Seal Rocks, a cluster of some extent, the highest part having 35 ft. elevation.

Anchorage will be found in S.W. winds under the inner Sugar-loaf Island (Motu-roa) on the following bearings: Pare-tutu in line with Miho Tahi (a small rocky hill of the Sugar-loaf group, which is an island at high water), S.W. by S.; the centre of Motu Mahanga, on with the North extreme of Motu-roa, West, in 5 fathoms water.

Sugar-loaf Point, the West point of New Plymouth Road, is a dome-like cone of trachytic porphyry, which rises to a height of 500 ft., and stands in an isolated position, with one side of its base washed by the sea. A strong smell of sulphuretted hydrogen gas, and a constant succession of bubbles of some bituminous substance rising to the surface of the sea, may be observed about half a mile from high-water mark, between the main land and Motu-roa, the highest of the Sugar-loaf Islands.

Immediately to the northward of Sugar-loaf Point was a whaling station, first established by Mr. Richard Barrett. This person, who played a prominent part in the colonization of this part of New Zealand, had resided here for several years, connecting himself with the native tribes by marrying the daughter of the principal chief here, and by this influence, combined with his own good qualities and great influence with the natives, he was the means of purchasing the district of Taranaki for the New Zealand Company in 1839. His name is also recognized at Port Nicholson, where he was a great promoter of the New Zealand Company's cause.

It is high water, on full and change days, at $9\frac{1}{2}^{h}$; springs rise 12 ft., neaps 9 ft. In the offing strong currents are experienced, influenced by the winds.

MOUNT EGMONT, which was named after the Earl by Cook in his first voyage, is one of the most remarkable mountains in New Zealand, and derives additional interest from the fact of its being generally the first land seen in approaching New Zealand from Europe. It is a regular cone, rising out of the midst of the generally level country before mentioned, which circumstance causes it to appear of greater magnitude. From its base, which is about 30 miles in diameter, it rises by a gradual ascent to the cone, which is stated by Capt. Stokes, R.N., to be 8,270 ft., or according to Dr. Dieffenbach, who ascended it, 8,839 ft. Its peaked summit, an extinct volcano, is enveloped in perpetual snow, and that, too, for the distance of 1,635 ft, below the top. There is no record, traditionary or otherwise, of any eruption having occurred from it.

TARANAKI PROVINCE, which lies around the base of Mount Egmont, extending from Mokau on the N.E. to the River Patea on the S.E., is described by all as the garden of New Zealand. Generally speaking it is level, except the broken ground in the courses of the numerous streams which flow through it. One remarkable feature of the shore is the iron-sand with which it is covered for many miles to the depth of several feet. This is valuable, as being a very pure ore, yielding 61 per cent. of iron, alloyed with 11½ per cent. of titanium, one of the most excellent alloys known.

CAPE EGMONT (*Boreel* of Tasman) is the western extremity of the projection of the Taranaki Province, and the N.E. point of Cook Strait. The coast here forms an obtuse point, which, rounding to the South and East, forms the eastern shore to Cook Strait.

LIGHTHOUSE.—On a knoll, 259 yards within the high-water mark of Cape Egmont, is a white iron tower, 67 ft. high, showing a *fixed bright* light, elevated 103 ft., and visible 15 miles seaward between N. ½ E. and S.S.E. Latitude 39° 16′ 47″ S., long. 173° 46′ 10″ E.

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2. COOK STRAIT.

In the previous pages the eastern and western shores of North Island are described, the former terminates at Cape Palliser, the latter at Cape Egmont. The space between these two forms the eastern shore of Cook Strait, a very important highway for Pacific navigation, but which, from its being subject to gales and strong winds, and having some few dangers to be avoided (none, however, it is believed, but what are well known through the survey), requires some care in passing. A few general remarks, therefore, will precede the descriptions.

WINDS.—In Cook Strait the prevailing, indeed the almost constant winds, are N.W. or S.E.; and approaching either entrance with N.E. or S.W. winds,

the former will almost certainly change to S.E., and the latter to N.W. The changes also from N.W. to S.E., and the contrary, are common, and frequently very sudden; lightning, or a dark bank of clouds rising, are pretty certain indications that the wind will come from the quarter in which they appear; but it is not an uncommon circumstance for a vessel running through the strait with a fair wind, on opening out either entrance, to be taken aback with one from the opposite quarter, with little or no warning. Gales from these quarters are also frequent, and blow with great violence; those from the S.E. are most frequent during the winter months of May, June, and July; a falling barometer is a certain indication. They come on very suddenly, last often three or four days, and are generally accompanied by rain and thick weather. N.W. gales are most common in spring and summer; they are exceedingly violent, though generally of short duration, and at their strongest raise a high barometer.

These winds are believed to be almost purely local, and their violence is in a great measure due to the configuration of the shores; they do not extend far beyond the line of the strait and the harbours which indent its shore; in proof of this, the head of Blind Bay on the southern side is remarkably exempt from strong winds, and frequently enjoys fine and calm weather while a gale is blowing in Cook Strait.

A vessel entering the strait from the northward, or leaving Port Nicholson bound to the southward, or to any of the ports on the eastern side of North Island, and meeting a S.E. gale before she is clear of Cook Strait, had better bear up and run to the N.W., making the passage round the North end of the island. Vessels under these circumstances have frequently made a quick passage to Auckland. Some directions are given for approaching Auckland through Cook Strait with a south-easter blowing, on page 434.

If bound to the southward, provided the weather is sufficiently clear to make the land, Cloudy Bay affords good shelter at its head, as also Port Underwood, according to circumstances.

To a vessel entering Cook Strait from the westward, and meeting a S.E. gale, Port Gore or Guards Bay afford good shelter if she is far enough advanced to fetch them; if not, she may run for Port Hardy, or to the westward of D'Urville Island for Croisilles Harbour. With time and daylight permitting, this latter anchorage is to be preferred, for the heavy swell raised by the tides across the narrow entrance of Port Hardy renders it more a steamer's than a sailing vessel's harbour.

CAPE PALLISER (*Kawa-Kawa*) has been described on page 407. It forms the southern extremity of North Island. It is composed of high mountains, very irregular, and terminating to the South in an obtuse point, which is accompanied by a narrow beach of low land, with some pointed rocks off it. Immediately to the West of the cape the coast runs up to the N.N.W. for 10 miles, forming one side of Palliser or Useless Bay.

PALLISER or USELESS BAY, an extensive open bight, lies at the South

extremity of North Island of New Zealand. The distance between the extreme points, Capes Palliser and Taourakira, forming the bay, is about 18 miles, and the depth of the bay about 8 miles. It lies entirely exposed to the full force of the S.E. winds; and, as the bottom is sandy, there is no holding ground for vessels, which renders it very dangerous.

The *Valley of the Wairarapa*, which runs from the head of Palliser Bay, has a N.E. and S.W. direction, averaging rather more than 9 miles in width; numerous settlements are established on its fine grazing land. At the southern end of the valley are two lakes, covering an area of 50,000 acres, but they are so shallow as to be comparatively useless. There is no entrance seaward, in consequence of a complete bar of sand, and they are surrounded by a tract of low swampy land. The bar, which is formed by southerly winds, to the full force of which Palliser Bay lies entirely exposed, closes the lake during the summer months (generally from December to May), until the accumulated waters burst the barriers that confine them, and open a passage to the sea. The *River Ruamahanga* runs through the whole valley, and loses itself in the lakes.

Taourakira Head is a bold headland, with the Rimutaka Mountains extending from it in a north-easterly direction along the West side of Palliser Bay; of this mountain range, the *Hump*, 3,400 ft. high, is 3 miles from Taourakira Head, and *Mount Francis*, 3,800 ft. high, lies over the N.W. angle of the bay. The outline of the land at the back of Taourakira Head is more regular than that of Cape Palliser, and, approaching from the eastward, it appears from a distance to end in a bold abrupt convexity; on a nearer approach, a low point will be observed extending from its base, which gives it much the appearance of the snout of a porpoise. Low detached straggling rocks extend off Taourakira Head and the coast westward, for one-third of a mile.

Baring Head is nearly 3 miles W.N.W. from Taourakira Head, and is a flat table point, at the extremity of terrace land, extending towards Pencarrow Head; detached rocks above and below water extend from it about one-third of a mile. A rocky ledge, having 4½ to 7 fathoms on it, lies N.W. ¾ W. 2½ cables from Baring Head; it lies parallel to the coast, and is 3 cables long by 1 cable broad; the surf breaks on it in bad weather. Pencarrow Point N. by W. leads westward of the reef, and Taourakira Point open of Baring Head E. ½ S., leads southward of it and the other dangers.

FitzRoy Bay.—The indentation of the coast between Baring Head and Pencarrow Head forms FitzRoy Bay, where small vessels sometimes ride out north-westerly gales, bringing the high rocks off Pencarrow Head, and those a quarter of a mile to the southward of them, to cover the entrance of the harbour. In 1881 the barque *Arabella*, drawing 15 ft., struck on a sunken rock, the approximate position of which the master gave as about 1 mile W.N.W. from Baring Head, with Pencarrow lighthouse bearing N.N.W. Vessels passing or rounding should give Baring Head a wide berth.

PORT NICHOLSON.

This is the situation of the first settlement, Wellington, made by the New Zealand Company in 1840. It is a noble expanse of water, and at its head the *River Hutt* debouches through a series of marshes. When once the harbour is entered, the ship is perfectly secure, and this security gives a favourable impression to the first intimacy with New Zealand. The harbour is surrounded by high hills, terminating abruptly at the water, and covered with trees and vegetation. The entrance lies between Pencarrow Head on the East and Palmer Head on the West.

The CITY of WELLINGTON, containing a population of 20,563 in 1881, is situated on the shores of Lambton Harbour, and has much increased in importance since the removal of the seat of the Colonial Government here from Auckland in 1865. The land between Pipitea Point and Government House has been reclaimed, and it is intended to fill in the shore within a depth of 4½ feet, as far as the Custom-house quay; there is a depth of between 5 and 6 ft. at low water alongside the part already completed. The Government offices, erected on reclaimed land just South of Government House, form a large white conspicuous building.

The Queen's Wharf affords facilities for vessels of 2,000 tons to load and unload; it has lately been considerably enlarged, and has a depth of 21 ft. at low water at the outer head. On the N.W. side of the harbour, about 1½ mile northward of Queen's Wharf, a railway pier has been constructed, extending in a S.S.E. direction, with a depth of 4½ fathoms close southward of the head. A *railway* connects Wellington with the Upper Hutt, &c., and is ultimately to be extended to meet the branches from East and West. The exports consist almost entirely of agricultural produce; in 1880 they were valued at £919,944. There is a *patent slip* in Evans Bay. *Water* may be obtained from a pipe at the head of the jetty at Government House.

Time Signal.—On certain days (notified in the *New Zealand Times*) a ball, painted *red* and *white*, is dropped from a staff at the custom-house at the instant of noon, New Zealand mean time.*

PENCARROW HEAD and LIGHT.—Pencarrow Head, N.W. by N., 3 miles from Baring Head, is the eastern entrance point of Port Nicholson; it is a bold cliff, with a lighthouse on its summit. The light is a *fixed bright* light of the second order, placed at an elevation of 420 ft. above high water, and in ordinary weather should be visible at a distance of 30 miles. From the lighthouse Baring Head bears S.E. by S. 3¼ miles, and Sinclair Head W. by S. ½ S.

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* Throughout New Zealand one uniform time is kept, called "New Zealand mean time," computed for long. 172° 30′ E, or $11^h\ 30^m\ 0^s$ in time, the approximate mean longitude of the New Zealand islands.

6½ miles. Low straggling rocks, above water, extend nearly 2 cables off this head. The lighthouse opens on an E. by N. ¼ N. bearing in coming from the westward, and N.W. ¾ N. coming from the eastward.

The land on the western side of the entrance is moderately high to seaward, but ascends considerably towards the harbour. At a distance of 10 miles it appears to be separated from the land farther to the westward, but is in reality connected with it by a low narrow isthmus, which divides Evans Bay on the harbour side from Lyall Bay. This has often been mistaken by strangers for the entrance to the harbour.

PALMER HEAD.—On the western side of the entrance, bearing W.N.W., 1½ mile from Pencarrow Head, is Palmer Head, from which a rocky reef projects southward to the distance of three-quarters of a mile. The rocks are all visible, and may be safely approached within a quarter of a mile. The *Pilot's* house is in a cove immediately westward of this head, and he will, if possible, come off on the usual signal being made. On the hills between Palmer Head and Point Dorset a *barrel beacon* is erected. About a mile West of Palmer Head is *Lyall Bay;* on the fern hills, West of this bay, on the summit of Mount Albert, 590 ft. high, is the signal station.

From the low neck between Evans and Lyall Bays, to the distance of 2 miles along the coast, the ascent is gradually hilly; the land rises considerably for 2 miles farther to Sinclair Head, where it is a bold cliff. Four miles to the northwestward the land continues high till it descends into the Oterango Valley, after which it rises in an almost semi-circular hill, called by the natives Omere (on the chart Terawiti). The remarkable convex appearance of this hill renders it easily distinguishable from Taourakira, or from Cape Palliser, when seen from a northerly or southerly direction.

Barrett Reef, which constitutes the chief impediment to the entrance of the harbour, is a cluster of rocks principally standing well out of water, lying nearly in the centre of the passage, and extending a little more than half a mile in a N. by W. and S. by E. direction, with an average width of about a cable. There is 7 fathoms within half a cable of these rocks, and no off-lying dangers; their southern extreme is a black rock 10 ft. out of water, which may be rounded within a cable in 9 fathoms. From this rock Pencarrow light bears S.E. by E. ¼ E. 1 mile.

The broadest and usual passage in is to the eastward of Barrett Reef, although there is a narrow and crooked channel (*Chalfers Passage*) to the westward, which is not used, as several sunken rocks are said to exist in it.

The *Main Channel*, or that between Pencarrow Head and Barrett Reef, has a clear breadth of not less than 6 cables in its narrowest part for a distance of 1½ mile. All the points of the coast on the eastern side of the entrance having straggling rocks awash extending a cable off them, vessels working in should be cautious in approaching close to this shore.

Dorset Point.—From *Dorset Point*, on the West side, a similar reef in fea-

ture to Barrett Reef, extends to the S.E. nearly 3 cables; and from the northern extreme of Dorset Point another reef, of which the remarkable *Steeple Rock* is the extreme, extends to the N.E. for 2 cables; and a cable north-eastward of Steeple Rock is a rock with 9 ft. on it at low water. The distance between the extremes of these two reefs is nearly three-quarters of a mile, and vessels working up may stand on until in a line between them, having then 21 ft. at low water. *Worser Bay* is on the western shore, half a mile above Steeple Rock, where a vessel may anchor if necessary in 5 fathoms, a quarter of a mile from the beach.

Ward Island, a small yellow-coloured cliffy island, lying on the eastern side of the channel, 2½ miles above Dorset Point, and 1¼ mile from the western shore, has shoal water extending from it to the West and S.W., nearly half a mile, leaving the breadth of the passage between the shoal water and the western shore little more than three-quarters of a mile. To avoid this danger, known as *Hope Shoal*, vessels with a leading wind, after passing Steeple Rock and its outlying danger, should keep the western shore on board within half a mile. There is a passage between Ward Island and the eastern shore, which is available for small vessels. The western side of Ward Island should not be approached within a long half mile, as the water shoals suddenly from 8 fathoms to 16 ft. at nearly that distance, and in one spot to 10 ft. This is named Hope Shoal, and is marked by a *red buoy* in 16 ft. on its western side.

Halswell Point is the North extreme of the peninsula on the western shore, and is 3 miles northward of Dorset Point: on rounding it, the town of Wellington will be opened out; rocks extend a cable off Halswell Point, and are marked by a *red buoy* in 5½ fathoms.

Evans Bay is immediately round Halswell Point, running nearly 2½ miles to the southward. *Jerningham Point*, its western point, has a rocky patch of less than 9 ft., lying nearly a cable from it, in a N.E. direction, marked by a *red buoy* in 5¼ fathoms. The shoal was raised by the earthquake of 1855, and a rock is now visible at low water. Evans Bay has an average breadth of more than half a mile, with no dangers, and deep water all over, from the sandy beach at its head. There are building-yards here, and a *patent slip*, capable of taking up vessels of 2,000 tons, is established and worked by a company in the bay; it is 1,050 ft. long, with a depth of 31 ft. at high water at its end, with a cradle which can be lengthened to 276 ft. Buoys are also laid down for swinging ships.

LAMBTON HARBOUR.—After passing Halswell Point, a vessel may steer W. by S. for the Government House flagstaff (about 2 miles distant), anchoring in the harbour as convenient; 4 and 5 fathoms, mud or sand, will be found within a quarter of a mile of its shores and outside that distance from 6 to 9 fathoms; a good berth is with the Government flagstaff bearing about N.W., and the Waterloo Inn—a large white building on the extreme of Kai-warra Point—just over the low sandy point of Pipitea (Kai-warra is 1 mile North of

Pipitea), a vessel will then be in 4 fathoms, mud, a quarter of a mile off shore; inside this line the water shoals rather suddenly.

Pipitea Point must not be approached within a quarter of a mile, as a sand and shingle shoal with 6 ft. water extends $1\frac{1}{2}$ cable from it; there is a watering place at this point, as also another at the head of the harbour from small streams.

Buoys.—Six *red* warping buoys are laid down in Lambton Harbour: one in 3 fathoms at 19 cables S.E. by E. $\frac{1}{8}$ E. from the observation spot on Pipitea Point, and another at $2\frac{3}{4}$ miles S.E. by S. $\frac{3}{4}$ S. from the same spot. Two lie respectively N.E. 16 cables, and E.N.E., northerly, $2\frac{1}{8}$ cables, from the North extreme of the outer part of Queen's Wharf, and the two others at S.E. by S. 1 cable, and S.E. $\frac{3}{4}$ E. 16 cables, from its South extreme.

Lights.—Three *fixed red* lights, arranged in a triangle, are shown on the Queen's Wharf; and on the Railway pier are two *fixed green* lights, 6 ft. apart horizontally, and elevated 28 ft.

An octagonal iron tower, painted white, stands on Somes Island, from which, at an elevation of 75 ft. above the level of high water, is exhibited a *fixed* light, showing *bright* in mid-channel, *red* on the western, and *green* on the eastern shore of the main entrance into the port. When bearing N. $\frac{1}{2}$ W. the bright light leads up the channel.

The light is intended as a leading light for vessels entering the port by the main channel of the entrance, and in clear weather should be seen from a distance of 10 miles, or 4 miles outside Pencarrow Head light.

From the lighthouse the centre of Ward Island bears S.E. by S. $\frac{7}{8}$ S.; Pencarrow Head, S. $\frac{5}{8}$ E.; Steeple Rock, South; Halswell Point, S.W. $\frac{7}{8}$ S.; and Jerningnam Point, S.W.

Caution.—When entering the port at night, be careful not to change the bright light on Somes Island for *red* or *green* after bringing Pencarrow light to bear E.N.E., until the *red* lights on the Queen's Wharf bear W.S.W., when a course may be steered to any part of the anchorage.

Somes Island, on which are the quarantine buildings and the lighthouse above described, is steep close-to, except at the North end where detached rocks extend $2\frac{1}{2}$ cables off. It is a cliffy island, 250 ft. high, about half a mile long, lying about the centre of the port. There is good anchorage at the head of the port in 8 fathoms, muddy bottom, about halfway between Somes Island and the beach, with the summit of Somes Island bearing South. The heads of the port will then be shut in, and you are well protected from southerly and north-westerly gales. The soundings have altered considerably in Port Nicholson since the date of the last survey.

Directions.—Running for Port Nicholson from the northward or westward with a fair wind, Cape Terawiti should be passed at a distance of 2 or 3 miles, and the continuous coast not approached nearer until arrived between Karori

Rock and Sinclair Head, when a vessel may haul gradually up towards the latter (taking care to keep Pencarrow lighthouse well open), and passing about 1 mile from the points of land to the eastward of Sinclair Head, until Barrett Reef opens out, when she may steer boldly for the southern end of the latter, passing it if necessary within half a cable, as before described.

The course from the berth recommended off Cape Terawiti is S.E. by E. ¼ E. for 7 miles to abreast Sinclair Head, and from thence N.E. by E., or when Palmer Head opens out, a ship will then be clear of the reported rock, nearly the same distance to Barrett Reef. During daylight all the out-lying dangers can be seen except Toms Rock, and the rock reported to the southward of Toms Rock. The tide between Cape Terawiti and Sinclair Head runs during springs 5 knots, and it is only with a commanding breeze that a vessel can stem it.

If the wind be moderate, and the weather clear, a vessel that is easily managed may work in by night or day, all the rocks being uncovered, except the 9-ft. rock N.E. of Steeple Rock, and a few in a line with Barrett Reef. She may, if necessary, lie inside the rock till daylight, being ready to weigh anchor immediately on a shift from the southward. Should the N.W. wind be too strong to work into the harbour, the entrance should be kept open; and, in thick weather, a sufficient offing preserved, in case of a southerly shift of wind—this, of course, will depend on circumstances.

"A steam-vessel bound to Port Nicholson through Cook Strait and meeting a south-easter might make a good passage, by anchoring first in Current Basin, from there steaming through French Pass and Admiralty Bay before the first of the southerly stream commences, enabling her to have the whole of that stream after rounding Francis Head; passing between Chetwode Islands and Harding Point, steering close by Motu Ngara Island and Capes Lambert and Jackson. If after passing the latter cape there is a possibility of reaching Port Nicholson during that tide she should stand over for the East shore of Cook Strait, as there the tide runs stronger; if there is no chance of saving the tide, she had better go up Queen Charlotte Sound for Tory Channel, anchoring, if necessary, in Oyster Bay, from thence she would easily reach Port Nicholson the next favourable tide."—Lieut. T. H. Tizard, H.M.S. *Challenger*, 1874.

It is hardly necessary to give any directions for approach from the eastward; care should be taken to avoid being embayed between Capes Palliser and Taourakira. As a matter of precaution against danger, the vessel should be kept under snug sail, if the weather be at all unsettled.

By night the light on Somes Island will be a sufficient guide.

Lyall Bay.—Three-quarters of a mile westward of Palmer Head is Lyall Bay; it is three-quarters of a mile wide, but is totally unfit for an anchorage. A sunken rock, having 17 ft. over it, is said to lie about 1½ cable E. by S. from the extremity of the reef which extends from the West entrance point.

Immediately westward of the head of Lyall Bay is *Mount Albert*, 590 ft. high, on which is the signal-staff. *Reef Islet* lies three-quarters of a mile westward of Lyall Bay. Proceeding westward, *Sinclair Head*, a high bold cliff, lies 5 miles W.S.W. from Palmer Head, and has foul rocky ground extending nearly half a mile off it.

From Sinclair Head the coast trends to the W.N.W. towards Cape Terawiti, which is 6½ miles distant; between these two headlands, 2½ miles westward of the former, is Tongue Point, a low projecting point, between which and Sinclair Head lie the following dangers to be avoided in approaching Port Nicholson from the westward:—*Karori* or *Seal Rock* stands high out of the water; it bears from Tongue Point S.W. half a mile, and is not connected with it, although a reef runs off that point for a considerable distance. *Toms Rock* is only just awash at low springs; it lies E.S.E. 1 mile from Karori Rock, being a short mile from the shore, and immediately off the Karori Stream. About threee-quarters of a mile to the southward of Toms Rock is a bank of 6 to 10 fathoms, on which tide rips may be observed, especially at flood tide. Another rock has been reported as lying S. ½ W. two-thirds of a mile from Toms Rock. Cape Terawiti should be kept well open westward of Karori Rock, and Pencarrow lighthouse open to the southward of Sinclair Head, when passing the coast between Cape Terawiti and Sinclair Head; the stream sets towards this coast.

Luna Rock, steep-to, has 6 ft. on it, and lies about half a mile off shore, with Karori Rock bearing S.E. by E., nearly 9 cables distant, and Macmanaman's house E. by N. ¾ N.

CAPE TERAWITI, or *Poli-wero*, is the easternmost projection on the narrow part of Cook Strait, and it was supposed by Cook and Foster that it might form the West point of a separate island; but this is not the case. It is a remarkably bold headland, rising immediately from the coast into almost a semicircular hill. From Cape Terawiti the coast turns to the N.N.E., and at 16 miles distant is Porirua Harbour, the shore between being cliffy and fronted with straggling rocks.

The tide between Terawiti and Sinclair Head runs very rapidly, particularly off the former cape, with a race like heavy breakers. The tide in Cook Strait runs North five hours and South eleven hours. Fortunately in these straits there are very few dangers that do not show.

MANA, or Table Island, 440 ft. high, is about 1¼ mile long, and half a mile broad, and 13 miles N.N.E. of Cape Terawiti. Its second name was given to it by Cook, from its appearance. The soil on it is good in some parts, where trees formerly grew, and the vegetation supports about 200 sheep and 30 head of cattle. The *light*, formerly shown on the N.W. part of the island, was discontinued in 1877, on the establishment of the light on North Brother Island, on the western side of Cook Strait.

The roadstead of Mana is a very bad one, according to Dr. Dieffenbach,

being open to the S.E. winds, with a strong tide setting in, though H.M. ships *Calliope* and *Driver* both rode out strong N.W. gales about one-third of a mile off the S.E. end of Mana, in 8 fathoms. The island is flat-topped, and very steep to seaward, but sloping down to the beach at the anchorage on the land side. Here there was a small whaling station, and a few sheep kept; little or nothing else to be had. Commander Hayes, H.M.S. *Driver*, says that ships may ride here safely in all winds that have no westing in them; 2 fathoms will be found 10 yards from the beach. Mana is connected with the main, 1½ mile distant, by a ledge of rocks, called the Bridge, the least water on which is said to be 3 fathoms, and is marked by kelp.

Porirua, opposite Mana, is only 12 miles from Wellington by land, with a good road between; a reef, which always shows above water, lies nearly in the centre of the entrance. The *harbour* is formed by a branch of the sea, like a T, and is only available for small vessels. At the entrance is a bar with 4 ft. at low water, which breaks with N.W. winds, and is then dangerous for boats to cross. Ships may ride safely in the bay, within the North head, with all winds that have no westing in them; but under Mana, which is close by, they may lay with those winds. Ships should on no account remain at Porirua with the wind N.W., as great difficulty has been experienced in getting out against the wind and heavy sea that then sets in.

For nearly 3 miles northward of Porirua the coast is high and cliffy, with straggling rocks extending off shore fully half a mile; from hence the coast trends with a gentle curve and sandy beach to the northward for 11 miles to the native settlement of Waikanai.

KAPITI, the **Entry Island** of Cook, stretches 5 miles long, North and South, by about 1¼ mile wide. It consists of a ridge of hills, rising in some places to the height of 600 ft. above the level of the sea, with some of its peaks of a pyramidal form, the highest in the centre is 1,780 ft. These hills descend abruptly to the West and East, forming a rocky and inaccessible shore throughout the greater part of its extent; they are intersected by deep ravines. At the South end the hills are not so steep. At the N.E. end the rock has been wasted by the violence of the waves, and its debris, with the sand, mould, and pumice-stone, brought down from the Tongariro Volcano by the Wanganui River, forms a band of low land extending around the N.E. end for about 3 miles, and is in some parts half a mile broad.

Kapiti is covered with a vigorous vegetation, mostly of trees, among which is some fine timber. It was formerly of great importance in the whale fishery, now nearly extinct.

Entry Anchorage, at the south-eastern end of Kapiti, is formed by three small conical-shaped islets, which, together with the reefs extending off them, afford good shelter from S.E. winds, and is protected from the N.W. by Kapiti itself. The two southernmost islets, *Hiko* and *Mahew*, are each about half a mile in circumference, lie nearly a mile eastward of the S.E. extreme of

Kapiti, and within a cable of each other; a reef also encircles both, and extends for more than a cable to the southward of Mahew, the outer islet. Between Hiko and Kapiti there is a channel a cable wide, with a depth of 15 feet.

Evans Islet, or the *Sugar-loaf*, lies little more than a mile to the N.E. of Hiko and Mahew Islets, and three-quarters of a mile from Kapiti. Passage Rocks exist midway between Evans Islet and Kapiti; they are awash, and have kelp round them. There is a passage for large vessels on either side of these rocks, but that between them and Evans Islet is narrow. A reef of rocks extends nearly 4 cables southward of Evans Islet.

To enter the anchorage vessels must pass between the end of this reef and Mahew Islet, the breadth of the passage being nearly a mile. The general depth of water within this boundary is from 17 to 12 fathoms; and with the centre of Mahew Islet bearing South, distant 4 cables, anchorage will be found in the latter depth, over sand and coral bottom, a quarter of a mile from the shore of Kapiti. Inside this berth the water shoals rather suddenly. Extensive whaling establishments formerly existed on the islets, and whalers have ridden out the whole winter gales at this anchorage.

Between Kapiti and the main land of North Island there is a general depth of from 20 to 30 fathoms, and the channel is clear of dangers, excepting the reefs which extend off the islets.

The coast between Kapiti and Cape Egmont was named by the whalers *Motherly Bay*, because the whales resorted hither for calving. Mr. Wakefield states that he has seen them basking in great numbers outside the surf, between Manawatu and the Patea.

The whole coast is a complete lee-shore, on account of the prevalence of north-westerly and south-westerly winds. A heavy swell sets towards the coast; and as the sea, to a great distance from the shore, has only a little depth, ships are obliged to keep a good offing.

From *Waikanai*, opposite Kapiti, the eastern shore of the strait presents the aspect of low and irregular hummocks, either downs or covered with fern, and improving in fertility the further they recede from the sea. This district is bordered, at the distance of 3 or 4 miles from the coast, by a wooded country, which rises gradually into ridges of mountains, covered with snow during the winter season. These mountains, which do not exceed 3,000 ft. in their greatest height, belong to a congeries of hills running towards the centre of the island. From these hills numerous short rivers descend.

Of these streams may be mentioned the *Waikanai*, the *Waimea*, the *Mahia*, the *Wai-e-rongo-mai*, the *Wahikewa*, the *Ohou*, the *Waiwiri*, the *Criwenua*, and the *Wai-ta-arwa*, which are passed in rapid succession. At the Waimea a large tribe of natives is stationed; their fortified village or *pah*, is called *Otaki*, and has a handsome church of native workmanship.

MANAWATU RIVER, 28 miles N. ¾ E. from Waikanai River, is the largest of all these rivers; it takes its rise in the most elevated inland range, the Ruapahu. The force of its waters is sufficient to remove the sand which is thrown up at its mouth by the S.W. and N.W. winds. Its breadth at the mouth is about 300 yards at half-tide. The river has an exceedingly winding course. Inside the bar it deepens sufficiently to admit vessels drawing 9 ft. for about 50 miles. It is stated that there is an easy communication from its upper part with the Hauriri, or Ahuriri, falling into Hawke Bay. There is 5 ft. water in the channel over the bar at low water spring tides; under the high bank, near *Pa Papangaio* (South bank), from 10½ to 21 ft., at low water spring tides; the tide rises 8 ft. at springs. There are two *beacons* on the North point of the entrance, which brought in one aboutE. by S. lead in, but it requires local knowledge.

A *railway* connects *Foxton*, at the mouth of Manawatu River, with Wanganui and Waitotara Rivers to the northward.

A *fixed bright light* is shown from a flagstaff at the pilot station on the North entrance point of the river; it is elevated 44 ft., and visible about 9 miles off. When there is sufficient water on the bar a *green* light will be shown on the outer beacon and a *red* light on the inner one. For *Signals*, see p. 349. Two moveable *beacons*, visible 2 or 3 miles, when kept in line lead over the bar; the outer beacon is painted *red*, and the inner one *black*.

In making this river it should observed that there is a remarkable grove of trees on the North side, about 3 miles inland. It is the first grove to the North of Waikanai, and serves as a good landmark.

About 10 miles from the mouth of the Manawatu, *Rangitiki River*, a smaller stream, admitting coasters drawing 6 ft. at high water, also rising in the Ruapahu, falls into Cook Strait. It brings down a great quantity of pumice-stone from Tongariro.

To the westward of a line drawn from Otaki to the Ruapahu, and thence to Mount Egmont, the country is comparatively level. Across this district the *Ruapahu* rears its massy head to the height of 9,195 ft., and is covered with eternal snows; at 7 miles northward of Ruapahu is *Tongariro*, an active volcano, estimated to be 6,200 ft. high. The land here is good, with excellent pasture for cattle.

Several streams run into the sea between the Rangitiki and the Wanganui, but are smaller and of less importance. The coast here has a great sameness of appearance, and the mouths of these different rivers present little peculiarity when viewed from the sea. Near the Wanganui the water shoals for the distance of about 3 miles.

WANGANUI RIVER enters Cook Strait at 23 miles N.W. of the Rangitiki. Its entrance is half a mile broad, but at low water its depth does not exceed 8 ft., so that it will only admit vessels of moderate burthen, in fine weather, with the aid of a pilot or local knowledge. Vessels drawing 10 to 12 ft. can

cross the bar and proceed up to the town of Petre. The headlands of the river are low; a spit of sand runs off the southern head, and the channel is, or was, near the northern. At low water the sea breaks across the bar. Inside the bar the river deepens, and is about 300 yards broad; its banks here are low and sandy, and covered with drift-wood and pumice-stone, which the river brings down from its source in the Tongariro volcano.

On the North head are two moveable *beacons*, the inner one the higher, from which are shown, when the tide serves and the bar is safe, red flags by day and *red lights* at night. Crossing the bar during the day, these two beacons should be kept in line; particular attention also being paid to the semaphore arm (used for guiding vessels inside the bar), on account of the curves in the channel. (See p. 349 for Signals.) At night, the two red lights of the beacons should be kept in line; particular attention being paid to the *green* light, which will be used like the semaphore arm, for guiding vessels inside the bar. This green light travels on a yard on the outer beacon, and vessels must be steered in the direction in which the light is moved. Sailing vessels should not attempt to cross the bar at night, as then the wind generally dies away or draws off the land. The best time to enter the river is from half-flood to high water.

Vessels entering off the bar at night, should burn flash or blue lights to make their positions known to the look-out at the pilot station, who will answer with a torch or flare light.

It is high water, on full and change, at $10^h\ 15^m$; the rise is from 6 to 8 feet.

H.M.S. *Esk*, on the 10th March, 1865, rode out a heavy gale from the S.E. off Wanganui, in 9 fathoms water, with the following bearings:—Extreme of Landguard, N.E. by E.; Tauperi, N. by E. $\frac{3}{4}$ E.; house on Cliff end, N. by E.; centre of Seven Hummocks, N.W. by N. $\frac{1}{4}$ N. The coming of the gale was indicated the previous night by the clouds passing rapidly over the moon towards the S.E., and the land and distant objects standing out with remarkable clearness. During the height of the gale the sea broke in 6 fathoms. Twenty-four hours from its commencement there was a dead calm, and the sea went down as rapidly as it rose.

The Landguard, a remarkable bluff head on the South side of the river, 2 miles from the South entrance point, is a prominent object; and about 12 miles to the north-westward are the *Seven Hummocks*, 8 miles from the coast, a remarkable range of hillocks extending 3 miles East and West.

The North Head is a castellated cliff, about 60 ft. high, on which are the two beacons before noticed. The southern point is of low sand-hills, and has also two beacons on it; these beacons were originally intended as leading marks through the channels, but the bar has shifted considerably since their erection, and continues to do so after gales or heavy floods, so that they now merely serve to mark the entrance. Works are now in progress to improve the entrance by confining the river channel within walls.

Lights.—A *fixed bright* light is exhibited from the flagstaff on Castle Cliff (North Head) Wanganui, 65 ft. above high water, which, in clear weather, should be seen 13 miles. Two *fixed red* lights are also shown from the beacons on the North Head, for crossing the bar; and two *red* lights are shown from the lower ends of the training walls half a mile above Landguard Bluff. The distance across the river between the two latter lights, is 500 ft.; they will be moved down the river as the works advance. A *fixed green* light is shown on beacon No. 4, on the North bank of the river.

The Wanganui River, passing through a great extent of mountainous country, is subject to very strong freshets, which, however, do not rise above its present banks. On such occasions the surface of the stream is covered with pumice-stone, from the volcanic district around Tongariro, and driftwood, which are found in large quantities all along the northern shore of Cook Strait.

Petre, about 4 miles up the West bank of the river, is a town founded in 1842, and has a good wharf, up to which vessels drawing 10 ft. can come. The situation is exceedingly picturesque, bold cliffs forming the opposite bank of the river, with which it is connected by a fine bridge 600 ft. long. The town site itself is level, with the exception of two or three low sand ridges covered with fern. A *railway* is now constructed to Foxton, on Waitotara River, and is ultimately to be extended to Wellington. The chief exports are cattle, sheep, wool, dairy produce, and flax. There was a population numbering 4,646 here in 1881.

From Wanganui River the coast trends westerly towards Cape Egmont, distant from it 75 miles, and the features of the land become entirely changed; the sandy beach and low land extending the whole distance from Waikanai now give place to perpendicular cliffs from 80 to 100 ft. high, composed of blue clay, which the sea washes at high water.

From *Waitotara Point*, a low sandy projection, 14 miles westward of Wanganui, and 2 miles S.E. of the river of the same name, the coast recedes gradually round Waimate bight, at whose northern limit is the site of the celebrated Waimate pah.

PATEA RIVER.—At about 26 miles from Wanganui River, is the entrance of Patea River, which has been much improved of late years by the construction of a breakwater, the end of which is marked by a ball *beacon*. The bar has now about 16 ft. on it at high water, and two moveable beacons, on which *red lights* are shown at night, on a sand-hill, at about 330 yards from the flagstaff, when in line about N.N.E. lead over it. Flags are shown on the beacons by day when the bar is safe, but vessels must also pay strict attention to the pilot's signals (p. 349). In moderate weather vessels can anchor in 6 to 7 fathoms, with the flagstaff bearing N. by W., but the bottom is foul in places.

Light.—On the eastern side of the entrance is a lighthouse showing a *fixed red* light, elevated 130 ft. above high water, and visible about 5 miles.

The town is about a mile above the entrance, and had a population of 834

in 1881; it is the port of a large and thriving district, and when the railway and harbour works are completed, will become of great importance.

Opunake Bay, one-third of a mile deep, and surrounded by cliffs, lies 10 miles S.E. of Cape Egmont, and S.W. from Mount Egmont. It is a suitable anchorage for steamers and small coasters, being protected from all winds from S.E. to N.W. Landing in 1872 was carried on by a cargo boat.

The N.W. head of the bay extends 200 yards seaward of the S.E. head, and from each of these, reefs extend about half a mile in a southerly and westerly direction, leaving an entrance to the bay one-third of a mile wide, which may be taken by keeping the flagstaff at the head of the bay in line with a *red beacon*, 10 ft. high, which lies S.W. by S. $\frac{1}{4}$ S. 96 ft. from it. Run in on this bearing till *two black beacons* on the port hand are in line, bearing N.W. $\frac{1}{4}$ W., then anchor in 4 fathoms, stony bottom. Some detached rocks lie $1\frac{1}{2}$ cable off the N.W. shore of the bay. Sailing vessels of 50 tons or upwards should anchor in 10 fathoms three-quarters of a mile off the heads, with the flagstaff bearing N.E. by N. $\frac{1}{2}$ N., and be prepared with strong on-shore winds to proceed to sea. The signals are described on page 349.

The SOUTHERN SHORE of COOK STRAIT is of a very different character to that of the south-western part of North Island, being intersected by many deep bays and arms of the sea, affording numerous anchorages and harbours. It extends from Cape Farewell to Cape Campbell.

CAPE FAREWELL is the northernmost point of Middle Island, and received its name from Cook, who departed from New Zealand at this point, March 31st, 1770. It terminates rather abruptly, its extreme showing from the eastward like an isolated cliff, descending in steps to the westward. The land immediately within the cape is from 400 to 600 ft. high, and 5 to 6 miles southward of it, mountains, varying in height from 1,000 to nearly 4,000 ft., extend to the S.W. until they nearly meet the Aopuri Range.

The most remarkable coast mountain on the western shore of Massacre Bay is *Mount Burnett*, or *Knuckle Hill*, which has a double rounded summit, the northernmost and highest is 2,085 ft. high; it is nearly 9 miles S.W. from Cape Farewell, and about 2 miles from the beach. This mountain can be advantageously used as a leading mark to clear Farewell Spit.

FAREWELL SPIT extends from Cape Farewell in an easterly direction 17 miles, slightly curving to the southward towards its extreme, and is the danger which ships must be careful to avoid in entering Cook Strait from the westward or southward. It is a treacherous spit, so great a part of its eastern extreme being covered at high water, and its southern or inner side being very steep-to. The portion which is always above water extends 13 miles from Cape Farewell, and maintains an average width of little more than half a mile.

It is composed of low sand mounds partially covered with vegetation. There is a cluster of bare sand-hills midway between the cape and the extreme, the highest of which is 90 ft. above the sea, and at the high-water extreme, or Bush-end Point, are several scattered bushes growing.

The LIGHTHOUSE on Bush-end Point is an open-framed structure of timber, 113 ft. high, painted in alternate bands of red and white. The light is a *revolving bright* light, excepting in the direction of the Spit End, between the bearings S.E. ¼ S. and E. by S. ¼ S., where it is *red*, attaining its greatest brilliancy *every minute*. It is elevated 120 ft. above high water, and in clear weather should be seen from a distance of 17 miles. The light is shut in by the sand-hills to the southward of E. by S. Vessels are cautioned not to open the northern edge of the light when within 4 miles of the lighthouse.

From Bush-end Point, the low-water extreme of the spit, which dries in patches, extends S.E. by E. 4 miles, and the water shoals suddenly at the distance of 1½ mile outside it, from 25 to 5 fathoms; the sea breaks heavily on it. This bank is called *Entry Bank* by D'Urville.

MASSACRE BAY, the westernmost anchorage in Cook Strait, lies between Separation Point and Cape Farewell, 20 miles apart N.W. ½ W. and S.E. ½ E. The land on both the western and southern sides is high; on the western side an extensive valley lies between two mountain ranges, through which winds *Aorèrè River*.

Tasman's Corner, in the N.W. part of Massacre Bay, is a horse-shoe shaped space of deep water, with good anchorage in 7 and 8 fathoms, well sheltered from easterly winds by the banks extending to the southward of the spit. It is 4 miles in extent either way, and so long as Fossil Cliff, the eastern extreme of Cape Farewell, is not brought to bear to the westward of N.W. by N., a vessel will be clear of the banks which form the eastern boundary of the anchorage.

The entrance of Aorèrè River is 1½ mile to the southward of Mount Burnett. The bar of the river extends more than a mile off shore, and is nearly all dry at low water. *Collingwood*, a township near the sea coast, and on the banks of Aorèrè River, owes its rise to the proximity of the gold fields. It has been constituted a port of entry. Its future prosperity will depend on the success of the gold, coal, and iron industries in the neighbourhood.

Coaling Road.—From Aorèrè River the coast of Massacre Bay trends south-eastward 8 miles to Coaling Road, which latter is 6 miles westward of Separation Point, and has good anchorage with southerly or easterly winds off Motu Pipi River in 4 fathoms, 1¼ mile from the shore at high water. Coasting vessels are built here. *Coal* was obtained with much facility from the face of some remarkable white triangular-shaped cliffs at the river's mouth; but as far as it has been superficially worked, it is found to be of inferior quality, and highly sulphureous. At 3 miles E.N.E. of Coaling Road anchorage, are the two Tata Islands, within which is a small anchorage sheltered from the N.W.

SEPARATION POINT, the north-western extreme of Blind Bay, and which separates it from Massacre Bay to the westward, is a small cliffy projection connected by a neck with high land rising immediately from it. At 1½ mile S.E. of Separation Point is a remarkable white stripe in the cliffs, useful as a mark for clearing Farewell Spit.

BLIND BAY is an extensive opening, the width from D'Urville Island to Separation Point, its north-western extreme, being 36 miles, and its depth within these limits 25 miles.

Nelson Haven lies at the head of Blind Bay. On the eastern shores of the bay is Croisilles Harbour; on its western are also several anchorages, namely, Tonga Roads, Torrent Basin, Astrolabe and Fisherman Roadsteads, with the rivers Motueka, Motuere, and Waimea; the depth of water in the outer parts of the bay varies from 25 to 28 fathoms, shoaling gradually to 12, 9, and 5 fathoms within 2 miles of its head. It is entirely free from danger, and the winds seldom blow home with violence in the upper parts; indeed, it is frequently fine and calm weather at Nelson when a strong N.W. gale is blowing in Cook Strait.

The land at the head of Blind Bay is low, with some remarkable white cliffs, but on either side it is mountainous; the Castor Peaks over Croisilles Harbour, Mount Duppa, and Double Mount, over the eastern side of the bay, rise to heights varying from 3,000 to 4,000 ft., and Mount Rintoul, a very remarkable sharp cone 4,720 ft. high, lies 15 miles South of Nelson. On the western side of the bay the land rises gradually from Separation Point; 8 miles to the southward of the point two peaks rise to a height of 3,700 ft., a high and generally snow-capped range extending from them southerly nearly 20 miles, terminating in Mount Arthur, which is 5,800 ft. above the sea level. This mountain is 25 miles W. by S. of Nelson.

Awarua Bay, 3 miles in extent, with sandy beaches, and having from 7 to 10 fathoms water, lies immediately southward of the white stripe, S.E. of Separation Point, and there is anchorage off it in 10 fathoms in moderate weather.

Tonga Roadstead.—This anchorage is 7 miles from Separation Point, and is a snug haven with all westerly winds from North to South. The small island of Tonga lies off the centre of it, and the anchorage is about 4 cables to the westward of the island in 8 fathoms. There is a passage on either side of Tonga Island.

Torrent Bay, the next anchorage, is 3½ miles south-eastward of Tonga Island, and 11 miles from Separation Point. It is more than half a mile in width between its North and South points (North Point and Jetty Point). The basin is in the southern bight, and affords good shelter for small vessels in 3 to 3½ fathoms, except in N.E. winds. There is good anchorage in 6 fathoms, with off-shore winds, in the outer part of the bay.

Astrolabe Road is only a mile to the southward of Torrent Bay, and is

separated from it by a peninsula, the neck of which is half a mile across. The anchorage is between *Adolphe Point*, its northern point, and *Adèle Island;* the latter is nearly a mile in length, and lies 4 cables from the shore.

Hapuka Reef, awash at high water and always visible, is a quarter of a mile eastward of Adolphe Point. It is marked by an iron *beacon* 13 ft. high, with cage painted *red*. There is also a sunken and dangerous rock, with 6 ft. on it at low water, lying in the entrance, a quarter of a mile North of Jules Point, the N.E. extreme of Adèle Island. The main channel between these dangers is 4 cables wide, with 8 fathoms water. The anchorage is half a mile within the entrance points in mid-channel, in 6 fathoms, the passage between Adèle Island and the main land being open. Astrolabe Roadstead will be found a snug little anchorage with all westerly winds from North to South. It is high water, on full and change, at $9^h\ 10^m$; springs rise 14 ft., neaps 10 ft.

Fisherman Roads are to the southward of Adèle Island, between it and Fisherman Island, an adjacent small rocky islet. It has good anchorage in 20 ft. at low water midway between the two islands.

NELSON.—This settlement was the fourth that was founded by the New Zealand Company, and was planted in October, 1841, on a site chosen by Colonel Arthur Wakefield, who afterwards fell in the terrible massacre of the Wairoa, in 1843. The population of the town and suburbs, in 1881, was about 9,323.

The available space for anchorage in Nelson Harbour for vessels of large tonnage is limited, and the approach to it is exceedingly narrow, with strong tides; it is therefore absolutely necessary for a stranger to engage a pilot; an excellent one employed by government is stationed at the entrance, and is always ready with his whale boat.

The harbour is formed between the main land and Boulder Bank; the latter is very narrow at high water, and is in one place then covered, with a boat channel over. There are also two patches, which may be called islands, as they are always well out of water. *Haul-ashore Island*, which is little more than a cable in extent, is at the southern extreme of the bank, and has a black post on its outer end as an anchorage mark; the other island is a small patch half a mile to the northward of Haul-ashore Island, and has a magazine built on it.

Arrow Rock, a high sharp rock, lies in the centre of the entrance a short cable's length South of the edge of Boulder Bank, which latter is marked by a beacon; and between the two is Entrance Ledge, with only 3 ft. water on it at low tides. The passage in is to the northward of this ledge, between it and the beacon, and does not exceed 50 yards in width.

Buoys mark the channel leading to the entrance: a *red* buoy surmounted with a white beacon lies at the extreme end of Waimea Sand in $3\frac{1}{2}$ fathoms, at low water, the lighthouse bearing E. by N., easterly, three-quarters of a mile, and the fairway buoy S.E. by S. $\frac{1}{2}$ S.; the inner buoy is two cables and the

outer one six cables outside Arrow Rock; one-third of a cable S.S.W. from the inner buoy is the fairway buoy *red with black* beacon. The inner edge of the bar is a quarter of a mile outside the outer buoy; the bar is 3 cables across, with 9 ft. on it at low water. Vessels of large tonnage can therefore only cross the bar and enter the harbour at or towards high water, when there is at springs a depth of 21 ft.

The LIGHTHOUSE is established to the North of the harbour entrance, for the use of large vessels anchoring outside the bar. The tower is of iron, octagonal, and painted white. It stands on the S.W. part of Boulder Bank, which forms the breakwater to the anchorage at about 10 miles southward of Pepin Island, and half a mile N. by E. of the Powder Magazine, in latitude 41° 16′ 0″ S., long. 173° 17′ 30″ E.

The light is *fixed bright*, visible from seaward through an arc of 120°, or when bearing from S. by W. ¾ W. round by East to E. by N., easterly, and appears *red* when bearing between E. by N. and N.E. by N., over the approximate position of the outer white buoy. It is placed at an elevation of about 60 ft. above high water, and should be seen in clear weather from a distance of 12 miles.

Two leading lights, the upper *bright* and the lower *red*, are shown from beacons on the eastern shore for entering the haven. When a vessel is known to be approaching at night, a light is also exhibited on the beacon off Haulashore Island.

The outer anchorage is good in moderate weather, and is in 6 fathoms water, with the light bearing E.S.E. Do not shut the light in, nor approach within the distance of 1 mile of the lighthouse.

With a strong N.W. wind a vessel would scarcely run for Nelson Haven, but take shelter in Croisilles Harbour until it moderated; it is not often, however, that this wind blows home with any violence at the head of Blind Bay.

Vessels running into Blind Bay for Nelson with a fair wind should get the eastern shore on board, and make Boulder Bank from 2 to 3 miles northward of the haven, running along its outer edge under easy sail at the distance of a mile, carrying 6 or 7 fathoms water.

The fairway is pointed out by two beacons at the entrance on the mainland. The upper of these beacons is painted white, and shows a *bright light* at night, the lower beacon being red, and showing a *red light*. The channels are buoyed, but the entrance into the haven is so narrow, the turn so sharp, and the tides so strong, that the safe navigation depends entirely on the skill of the pilot, and no directions could avail a stranger. For these reasons, and as it is probable that the bar and the entrance varies in different seasons, it will not be necessary to give instructions for entering the haven, seeing that nothing ought to justify a stranger to do so without a pilot, unless in the greatest emergency, and then the Admiralty plan will be the best guide.

The *tides* run rapidly along the eastern shore of the harbour. It is high water,

on the full and change, at $9^h\ 50^m$; springs rise 14 ft., neaps 10 ft. The streams of tide change $0^h\ 17^m$ after high and low water, at springs; the flood runs for $7^h\ 10^m$, and the ebb $5^h\ 40^m$.

Small vessels and coasters enter Nelson Haven with ease on the flood tide; and under the skilful guidance of the pilot, vessels of 1,000 tons have been conducted to safe anchorage with scarcely less facility. The best anchorage for a large vessel is just round Haul-ashore Island, with the beacons E.S.E. in 5 to 6 fathoms, mud, as there it is still water, and the ship is moored head and stern, there being a mooring buoy for the stern chain. In consequence of the great range of tide, Nelson Haven is one of the few places in New Zealand where a vessel of large tonnage may beach herself for repairs.

Waimea River, to the westward of Nelson Haven, discharges itself into Blind Bay by three channels; the waters from its eastern mouth, together with those from Nelson Haven, have formed a deep hole 4 cables westward of Haul-ashore Island, or between the tail of Boulder Bank and the eastern end of Waimea Bank, where there is anchorage in 6 or 7 fathoms, sheltered in some measure by the bar outside it. This anchorage is known as *Bolton Hole*, and a good berth is in a line between the buoys, with the South end of Haul-ashore Island in one with Stafford's House.

Vessels during N.W. gales, unable to enter Nelson, sometimes took shelter in the eastern mouth of Waimea River, but the river is now silting up and a depth of only 5 ft. was found in 1875 over its bar. The central and western mouths of Waimea River are respectively $2\frac{1}{2}$ and $6\frac{1}{2}$ miles westward of Nelson, and are navigable for coasters. Two miles to the N.W. of the western mouth commence the remarkable white cliffs, which extend more than 3 miles along the coast.

Pepin Island is 10 miles N.E. from Nelson; it is close to the main land, and appears like a point of it, being united at high water by a sandy beach. It will be easily distinguished by the land to the northward receding.

CROISILLES HARBOUR, on the eastern side of Blind Bay, and nearly 10 miles N.E. of Pepin Island, is easily accessible, affords good shelter in all weathers, and is the best eastern port of refuge in Blind Bay for vessels of any size caught in N.W. gales. *Castor Peaks*, 3,300 ft. high, lie South 6 miles from *Cape Soucis*, its South point. Three small islands lie to the westward and southward of its northern entrance point, at distances of nearly 2 miles. The westernmost is a high conical island, with rocks extending seaward from it nearly a quarter of a mile, almost awash at high water; the southernmost is Williams Island. Within these islands is foul ground and shoal water, and it will be advisable in entering to give them a berth of half a mile.

The width of the entrance between these isles and Cape Soucis is nearly 2 miles, with a depth of 10 fathoms; working in, after passing Williams Island, vessels should not stand to the northward of a line between it and the inner North entrance point. There is good anchorage in 7 fathoms, mud, between

this island and the point, the island bearing W. ¾ N., and the point N.E. by N. three-quarters of a mile distant.

D'URVILLE ISLAND (*Rangitoto*) forms the eastern side of Blind Bay. It is 17 miles in length, by 5 or 6 miles in breadth, and is separated from the main by the narrow and dangerous Current Basin and French Pass. It is very hilly, and rises abruptly from the sea, the highest point being 2,180 ft., and appears to be covered with a dense forest from the water's edge to the summit. Where no wood covers the steep sides of the hills, a barren-looking stratified rock appears. A vein of copper ore has lately been discovered on this island.

Stephens Island, 2 miles N.E. from the northern end of D'Urville Island, is conspicuous; though small, it rises abruptly to the height of 1,000 ft. There is no safe passage inside it. Off the South extreme of D'Urville Island, that is, at the N.W. of the entrance to Current Basin, are *Piège Rocks*, three rocks above water, bearing from Sauvage Point, the South extreme of D'Urville Island, S. ¼ E. three-quarters of a mile. The *Chicots*, three larger rocks also above water, and covering a space of a quarter of a mile, lie W. ½ S. 1½ mile from the same point, with a reef nearly a mile to the north-eastward, between them and the shore of D'Urville Island. Another danger, discovered by H.M.S. *Pandora*, also exists; it is a rock about 50 yards in extent, visible at low water, between the Chicots and Sauvage Point, bearing from the largest of the former E. by N. ½ N. 7 cables, and from the latter W. by N. ½ N. 5½ cables, and is just without the line from the high-water extreme of Lebrun Peninsula and Sauvage Point.

Current Basin then runs to the N.E. 3 miles, with a width of nearly a mile, and a general depth of from 15 to 20 fathoms, rocky and gravel bottom; it then communicates through French Pass with Admiralty Bay.

FRENCH PASS is the narrow strait between the South end of D'Urville Island and the main land, affording communication between Admiralty and Blind Bays; in its narrowest part, between Reef Point on the North, and Channel Point on the South, there is only a clear and straight channel of 117 yards between the extreme of the rocks to the North, and the low-water mark of the South shore, both being perfectly steep-to. On the extreme of the rocks, which are only uncovered at low springs, an *iron perch* is placed, so that vessels passing through at any time of tide can see exactly the breadth of the channel, and may pass as close as 10 yards to the iron perch, if necessary. There is an awkward 8-feet shell bank before reaching the pass from the Current Basin side. Its North extreme is only 2 cables from the iron perch.

A *white* buoy has been placed on the north-eastern edge of the middle bank, rendering the navigation of the channel much more easy. Notwithstanding that the French Pass is constantly used by the mail and coasting steamers running between Nelson, Picton, and Wellington, they never pass through against the tide, always going round D'Urville Island on those occasions, and, taking into consideration the eddying nature of the currents, it is dangerous to attempt to

go through against the tide, since a very slight sheer would run a vessel aground in a moment; but at slack water, or with the tide, there is no danger to a steam-vessel conducted with ordinary care. Notwithstanding that the pass is safe, it is scarcely to be recommended for large vessels.

Rangi-Toto Roadstead is a convenient anchorage with westerly winds ranging from North to South; it is on the eastern side of D'Urville Island, 4 miles from Cape Stephens, the northern extreme. The anchorage is in the southern bight of the bay, about one-third of a mile off shore.

Port Hardy, at the northern end of D'Urville Island, lies between Cape Stephens and Nile Head, the latter forming its western entrance point. These headlands bear N.E. and S.W. from each other, distant 4 miles. Vessels making for the port from the eastward should pass to the northward of Stephens Island, as there are two clusters of rocks in the passage between it and D'Urville Island.

Nelson's Monument and *Victory Isles* are in the entrance of Port Hardy, the former a high rock lying a mile to the eastward of Nile Head, and the latter a cluster of small islands south-eastward of, and the same distance from, the Monument, with the Fleet (a cluster of rocks) extending again from them to the eastern shore.

The passage into the port is on either side of Nelson's Monument, in deep water; to the eastward, or between it and Victory Islands, is the widest channel, as a reef extends 1½ cable off both Nile and Trafalgar Heads—the outer and inner western entrance points—which narrows the channel on that side. The port runs to S. by W. 2¼ miles, with an average width of three-quarters of a mile, when one arm takes an easterly direction, and the main branch continues its southerly trend, both extending for about 2 miles, with anchorage in 14 fathoms; and no less depth than this will be found in any part of the port.

It is high water, on full and change, at 9^h 55^m, and the springs rise 12 ft.; the tides set directly across the entrance. Off Stephens Island the flood or north-westerly stream begins at 5^h 15^m, and the ebb or south-easterly at 11^h 15^m.

Greville or Brooke Harbour is on the western side of D'Urville Island, 6½ miles southward of Nile Head. *Mount Woore*, the highest land of the island, 2,180 ft. high, rises over its northern shores. The entrance points lie North and South of each other, 1 mile apart, and a rock 4 ft. out of water lies a quarter of a mile N.W. of the South entrance point (Rugged Point). The harbour runs S.S.E. for 1½ mile, with a width of nearly a mile, the depth from 7 to 10 fathoms.

ADMIRALTY BAY lies between D'Urville Island and the peninsula which forms the western entrance of Pelorus Sound. It runs in a south-westerly direction, is 7 miles in depth, and 4 miles in width, at the entrance. Off the entrance are *Trio Islands*, and 4 miles to the N.E. of the latter are *Jay Rocks*.

PELORUS SOUND.—This great inlet, which lies between Admiralty Bay and Guards Bay, is similar in character to Queen Charlotte Sound to the S.E.;

it extends in a southerly direction about 25 miles, branching off to the eastward and westward into numerous arms and creeks, and embracing no less an extent of coast line than 250 miles. Its entrance on either side is formed by a peninsula, the western being almost isolated by the head of Croisilles Harbour, the isthmus which divides their waters being only half a mile across; and the eastern by a narrow neck of 100 ft. broad, which separates it from the bight westward of Forsyth Island, while an arm at the south-eastern head meets within less than a mile of Separation Inlet at the head of Queen Charlotte Sound.

Except at the head of the main branch, the general character of the country is mountainous, rising with almost perpendicular acclivity to heights of from 2,000 to 3,000 ft., and clothed with dense forests.

The N.W. end of Forsyth Island forms the eastern outer entrance point, and Harding Point the western, being little more than 2 miles apart. Chetwode Islands lie immediately off the mouth of the sound, distant nearly 2 miles from either entrance point; they are two narrow islands, 3 miles long, lying in a N.E. and S.W. direction, connected by a reef, and rather remarkable, with sharp peaked summits 800 ft. high. A reef of rocks above water extends half a mile N.E. of the easternmost island, and Sentinel Rock, 65 ft. above the sea, lies E.N.E. 1½ mile from the N.E. end of the same island; there are also heavy tide ripplings about these islands.

Vessels may enter Pelorus Sound on either side of Chetwode Islands. A high rock out of water lies in the eastern passage a long half mile from the S.E. side of the larger or S.W. island. There is also a sunken rock, about three-quarters of a mile from the South end of Chetwode Islands, and the same distance S.W. from the rock out of water; it has 5 ft. on it at low water springs.

Oke Rock, which covers at half tide, lies in Kaka-ho Channel, the passage between Chetwode Islands and Entry Point, not more than 3 cables from the western shore, with 25 fathoms round it. A small iron *beacon*, painted red, and surmounted by a ball, has been placed on it, and shows 8½ ft. out of water at high water springs. Should the beacon not be seen, this rock may be avoided on entering Pelorus Sound, through Kaka-ho Channel, by keeping the reef, extending from the N.W. end of Forsyth Island, on the starboard bow until West Entry Point is open, which clears it.

Port Ligar, immediately within West Entry Point, is a fine harbour, and equal to any in Cook Strait; the outer portion (*Kopi*) has from 14 to 17 fathoms water. The northern shores are separated by a narrow neck, a quarter of a mile wide, from Admiralty Bay. The North entrance point of Port Ligar is a long yellow clay point tapering to the water.

The depth of water in Pelorus Sound varies from 45 to 16 fathoms, gradually decreasing in the main branch towards its head, where it receives two rivers forming shoal banks at the head of that arm. With this latter exception, the

rock just noticed, and Kainoki, a sunken rock off the entrance of Waihinau Bay, the second bay on the western side, there is no obstruction to navigation; and the sound has this peculiarity, that the nearer the points are approached, the deeper is the water.

In Pelorus Sound there are at least thirty bays or anchorages, mostly land-locked, and safe in any winds. The gusts in bad weather are very furious. Fresh water may always be obtained; fish in abundance may be caught off the points.

GUARDS BAY lies to the eastward of Pelorus Sound, between Alligator Head and Forsyth Island, and with its inlets Titirangi and Akaloa affords shelter from all winds; the small island *Motu Ngara* lies in the entrance, 1⅓ mile N.N.W. of Alligator Head, and has a reef awash at half ebb extending one-third of a mile eastward of its eastern end. There is a deep-water channel between this reef and Alligator Head, as also a broad and clear channel between Motu Ngara and Forsyth Island.

Forsyth Island, which forms the western side of Guards Bay, is 3 miles long, North and South, and is separated from the mainland by a very narrow channel, with 7 fathoms water in it.

Waitui Bay, the next bay eastward, lies between Cape Lambert and Alligator Head; it is 3 miles wide at the entrance, and about 2 miles in depth. The shores around are steep and cliffy, and it is not a place of shelter.

PORT GORE is the extensive inlet to the S.E. of Guards Bay, and forms a noble harbour of refuge for vessels caught by an adverse gale in Cook Strait. The entrance is between Point Lambert and Point Jackson, which are 3½ miles apart *Melville Cove* is the inner anchorage, in 12 to 15 fathoms, in Port Gore, lying in its S.W. corner, and protected by the peninsula, of which *Hart Point* is the South extreme. The inner anchorage of Port Gore lies to the West of this point. The turn and range of the tides are at the same time as at all other parts of Cook Strait. The surrounding land is very high and wooded. In the southernmost angle of Port Gore is *Cockle Bay*, open to the North. Hence the S.E. side of the inlet trends directly to the N.E. to Point Jackson, which separates it from Queen Charlotte Sound.

The land is high over the head of Port Gore, and thickly wooded. In the centre of the peninsula, less than a mile from the head of Cockle Bay, *Mount Furneaux* rises to a height of 2,600 ft., and *Stokes Mountain*, the highest in the neighbourhood, 3½ miles south-westward of the head of the port, attains an elevation of 3,900 ft.

QUEEN CHARLOTTE SOUND is one of the most interesting points of New Zealand, as it was here that Cook remained during each of the voyages in which he made so complete an examination of this, till then, *terra incognita*. The following description of it is given by the great circum-navigator in the account of his first voyage:—"The entrance of Queen Charlotte Sound is situated in lat. 41° S., long. 174° 30′ W., near the middle of the S.W. side of the strait

in which it lies. The land off the S.E. head of the sound, called by the natives *Koamoroa*, off which lie two small islands and some rocks, makes the narrowest part of the strait. From the N.W. head (Cape Jackson) a reef of rocks runs out about 1 mile, in the direction of N.E. by N., part of which is above water, and part below. By this account of the heads the sound will be sufficiently known. At the entrance it is 3 leagues broad, and lies in S.W. by S., S.W., and W.S.W., at least 10 leagues, and is a collection of some of the finest harbours in the world."

Cape Jackson, the northern entrance point, is a long narrow elbow-shaped point, the extreme of a peninsula which separates the sound from Port Gore; it is remarkable from its shape, flat towards the extreme, where it is 280 ft. high, and rising at the elbow to 740 ft. Two flat black rocks lie off its outer extreme, the outer one a mile N.E. by N. from it, and 3 ft. above high water. There are always tide ripplings off these rocks, and the tides set across the entrance of the sound with considerable strength on both points. Vessels should avoid the boat passage North of Cape Jackson.

White Rocks, *Motuara*, and *Long Island*, lie in the entrance of the sound; the former are a ridge of peaked rocks a quarter of a mile in extent, high out of water, and bearing W.N.W. a mile from Cape Koamoroo, with a passage on either side of them. The two islands lie 3 miles within the line of the entrance capes, Motuara on the western, and Long Island on the eastern side; there are also passages between and on either side of them. This great inlet is singularly free from dangers.

H.M.S. *Challenger*, in July, 1874, anchored in Queen Charlotte Sound, between Long Island and Motuara Island, in 7 fathoms, with Twin Rocks in line with the northernmost Long Island E. ½ S., half a mile distant; this was found to be an excellent anchorage with S.E. gales, the wind being far more moderate, and the ship lying easier at her anchor than at Port Hardy during the same sort of weather.

Ship Cove.—Capt. Cook says:—"The land forming the harbour or cove in which we lay, is called by the natives *Totarranue;* the harbour itself, which I call *Ship Cove*, is not inferior to any in the sound, either for convenience or safety; it lies on the West side of the sound, and is the southernmost of three coves that are situated within the Island of Motuara, which bears East of it. Ship Cove may be entered either between the *Island of Motuara* and a long island, called by the natives *Hamote*, or between Motuara and the western shore. In the last of these channels are two ledges of rocks, 3 fathoms under water, which may be easily known by the seaweed that grows on them. In sailing either in or out of the sound, with little wind, attention must be paid to the tides, which flow about 9 or 10 o'clock at the full and change of the moon, and rise and fall between 7 and 8 ft. perpendicularly. The flood comes in through the strait from the S.E., and sets strongly over upon the N.W. head, and it

reef which lies off it; the ebb sets with still greater rapidity to the S.E. over the rocks and islands that lie off the S.E. head."—(February, 1770.)

A shoal rocky patch of 12 ft. extends North from the North end of Motuara, and has a rock at its extreme with 6 ft.; the latter is distant nearly three-quarters of a mile from Motuara, and is marked by kelp.

The hill immediately over the South side of Ship Cove has a bare yellow-looking summit, 1,292 ft. high, and South of it a cove runs in for a mile, being about the same width at its entrance, and with 27 fathoms water in it. The adjoining bay, a mile to the southward, and the most considerable in extent on the North side of the sound, is *Endeavour Inlet;* it runs to the northward for 4 miles, with two arms.

Many Coves Bay is the next, a spacious and desirable anchorage; above it is *Fly Bay*, off the eastern entrance point of which, S.W. ¾ S. nearly one-third of a mile, is *Luke Rock,* with 3 ft. at low water, and marked by a *black buoy.* There is also a *red buoy* placed on *Hawes Rock* of 10 ft., which lies about half a mile off the S.W. end of Pig Island, fronting Endeavour Inlet.

The average width of the main arm of the sound above Fly Bay is nearly a mile, and the bays and coves are so similar in features that it will be unnecessary to offer any particular description.

During strong winds in Cook Strait, Queen Charlotte Sound is liable to heavy gusts off the high land and out of the mountain gulleys, which give little or no warning, and it is necessary to use caution, especially with boats under sail.

Picton, the capital of the province of Marlborough, is situated at the head of Queen Charlotte Sound about 18 miles from the Tory Channel entrance. The population of the town in 1881 was 834. A railway connects Picton with Blenheim, 18 miles to the S.E., and the largest town in the province. *Coal* was discovered in the neighbourhood of Picton in 1880, which will greatly add to its importance, if of sufficiently good quality. There is a wharf here, with a depth of 15 ft., alongside, on the end of which a *fixed red light* is shown 20 ft. above high water, and visible 6 miles off.

ARAPAWA ISLAND, or *Alapawa* or *Wellington Island*, forms the S.E. side of Queen Charlotte Sound, its insularity being determined by the *Tory*, in 1839, and the strait to the southward, separating it from the main land, was named the Tory Channel. The island is about 15 miles in length, N.E. and S.W., and of an irregular breadth.

East Bay, on the western side of Alapawa Island, is an extensive inlet, 4 miles in depth and 1½ mile in width, being only separated from the sea by a steep and narrow ridge; the entrance of this bay is 1 mile south-eastward of the South point of Long Island, and 5 miles south-westward of Cape Koamaru; there is 25 fathoms water all over it.

Pig Island, 2 miles South of Long Island, is more than 2 miles long, and is 1,023 ft. high. A *red buoy* marks the position of Hawes Rock as before

described. The channel to the westward of the island is the fair channel up the sound.

CAPE KOAMARU is the northernmost point of Arapawa Island; it has a cone-shaped hummock on its extreme, and immediately inside it a higher hill, 936 ft. above the sea; it will also be known by its proximity to Brothers Islands. About a quarter of a mile from the extremity of the reef on the West side of the cape is *Stella Rock*, on which the vessel of that name struck in 1880. It is nearly a cable in extent, North and South, with a least depth of 6 ft. on it at low water springs, and lies with White Rocks bearing N.W. ½ W., and Cape Koamaru E. by N. ¼ N. The South extreme of Long Island just open of the westernmost Twin leads 1½ cable N.W. of it.

Wellington Head, between Cape Koamaru and the eastern entrance to the Tory Channel, is the point of Middle Island nearest to North Island. It is a bold prominent headland, rising to the height of 2,190 ft. The narrowest part of Cook Strait, between this headland and Cape Terawiti, is 12 miles across.

Off this part of the coast lie the principal dangers in Cook Strait, namely, two rocks awash north-eastward of Wellington Head; Brothers Islands, with their reefs; and Cook Rock.

The first of these dangers, the *two rocks awash*, occupy a space of one-third of a mile in a North and South direction. They lie N.E. by N. from Wellington Head, distant 3½ miles, and are 2½ miles from the nearest part of the coast, with 48 fathoms in mid-channel between.

BROTHERS ISLANDS are two small islands, about the same size, each nearly a third of a mile in length, and about 235 ft. high; they lie nearly a mile apart in a N. by E. and S. by W. direction, and bear from Wellington Head N. by E. ¼ E., the southern is distant 5 miles; the northern islet bears East 2½ miles from Cape Koamaru.

LIGHTHOUSE.—On North Brother Island is a white wooden lighthouse, 28 feet high, showing a *flashing bright* light, with a flash every 10 seconds, elevated 258 ft., and visible 22 miles in clear weather. From the lower part of the tower a *fixed red* light is shown in an arc of 5° over Cook Rock.

There is no passage between Brothers Islands; several rocks and reefs are scattered about them, and the tides are very strong with heavy ripplings: a rock, with about 3 ft. on it at low water, lies W. by S. ¼ S. from the centre of the South island, a long half mile distant, which narrows the passage between the Brothers and the land of Cape Koamaru to little more than a mile; this passage is not recommended, and Brothers Islands should not be approached within a mile by a stranger.

Cook Rock is highly dangerous, as it is only awash at low water springs, and is in the track of vessels passing through Cook Strait from the westward, and also of those entering Queen Charlotte Sound. It lies N. by E. ¼ E. from Cape Koamaru, distant 3½ miles; and from Cape Jackson, the northern entrance

point of the sound, E. by S. ¼ S., distant 5⅔ miles; there is generally a tide rippling on and about Cook Rock, and in strong winds it will be seen to break before low water—when visible it resembles a whale's back. The West end of White Rocks (Queen Charlotte Sound) in a line with the North end of Long Island, bearing S.W. ½ S., leads directly on Cook Rock. The *red* light on North Brother Island will point out its situation at night.

Tory Channel.—At 2 miles south-westward of Wellington Head is the eastern entrance to Tory Channel (leading to Queen Charlotte Sound), its northern side being formed by Alapawa Island, and its southern side easily distinguishable from its chalky cliff-like appearance. This channel is frequently used with advantage by small coasting vessels, but is not recommended for large ones; the entrance is narrow, being only a quarter of a mile wide, and the strength of the tide during springs attains a rate of 5 knots; two peaked rocks extend to the S.E. from the northern entrance point, and there are also some rocks above water lying a short distance off the southern point. The channel, which is 7 miles in length, maintains an average width of about half a mile, the depth being from 25 to 35 fathoms, but there are several coves on either side, with good anchorage in 6 to 9 fathoms.

Lights.—On *Alapawa Island* are two horizontal white *beacons*, 21 ft. high; at night a *fixed bright* light is shown on each, the low light being elevated 22 feet above high water, at 12 yards distant from high-water mark; and the high light, elevated 86 ft., at 166 yards from the low light. These beacons or lights kept in line lead through the centre of the entrance to Tory Channel.

PORT UNDERWOOD, 15 miles S.W. by S. from Wellington Head, the coast between being rugged and cliffy, is a good and spacious harbour, accessible in all weather, and a frequent port of refuge for vessels unable to enter Port Nicholson, or to pass through Cook Strait; it lies at the North end of Cloudy Bay, and is 32 miles W. by S. ¼ S. from the entrance of Port Nicholson. The land in the immediate neighbourhood is mountainous, the thickly wooded peaks of *Mount Robertson* rising over its western side to a height of 3,283 ft., and the *Treble Mountain* adjoining it, 2,930 ft.

The harbour runs nearly North and South 4 miles, and in its upper part is divided into two arms by a high and narrow peninsula 2 miles in length; these arms form each a separate and well-sheltered harbour, their upper portion reaching within 1½ mile of the western entrance of Tory Channel, leading to Queen Charlotte Sound. The entrance is well marked from seaward; off its eastern point (Robertson) are two rocks well out of water, with straggling ones awash near them; this point should not be approached within 2 cables. A distinctly-shaped saddle hill rises half a mile to the eastward of Robertson Point; the coast drops suddenly between this saddle hill and the higher land to the eastward.

A detached rock above water lies S.S.E. 2 cables from the North point of Robin Hood Bay, the western entrance point of Port Underwood; no other

dangers exist but those just mentioned. The width of the entrance is a mile, the average depth within being 9 fathoms. Several snug bays run in from the general line of coast on either side of the port.

CLOUDY BAY, in which Port Underwood lies, is a name derived from Capt. Cook, and is well applied. It is limited to the South by a cape called *White Bluff*, 12 miles from Port Underwood, and has a convenient depth of water for anchorage.

The coast to the southward of Port Underwood continues steep and rocky for about 6 miles. Along the whole of this distance, with the exception of two places, where they recede and form two small coves, open to the S.E., their declivities are abruptly cut off, seaward, into craggy cliffs and broken rocks, hanging over and jutting out into the sea, and split and shattered into every variety of ruggedness. The coast then trends out to the East; the hilly range recedes to the S.W., and a broad sandy beach extends across the West end of the Wairau Plain.

Wairau River, which falls into Cloudy Bay, at 8 miles from Port Underwood, rises at about 65 or 70 miles from its mouth, in direct distance, among the high and snowy mountains. All the advantages, however, are reduced by the character of the entrance of the river. It has a bar across it, with 6 feet on it at high water, which renders it difficult of access, except in boats in calm weather. A signal-staff stands on its western point, where a flag is hoisted when boats or small vessels can enter, and lowered half-mast when the bar is impassable; vessels may anchor 1 mile off the entrance in 5 fathoms.

Light.—A *fixed bright* light, elevated 38 ft. above high water, and visible about 11 miles, is shown from the flagstaff.

The Wairau is unhappily celebrated by the massacre of twenty-two Europeans, including Captain Arthur Wakefield and other leading colonists of Nelson, on June 17th, 1843. This terrible event—an ample evidence of native treachery and ferocity—occurred during the adjustment of some land claims.

The WHITE BLUFF is a very remarkable range of steep, white-faced cliffs, their highest summit being 890 ft. high, rising boldly from the sea; a mountain range extends from these cliffs to the W.S.W., and is the southern boundary of the Wairau plains, an extensive tract of grazing country, occupied by the Nelson settlers.

CAPE CAMPBELL, 12 miles S.E. from the White Bluff, is the S.W. entrance point of Cook Strait. It bears from Cape Palliser W.S.W., distant 44 miles. It is a remarkable low, salient point, and should be approached with caution, especially at night in thick weather.

The LIGHTHOUSE is an open wooden structure, 73 ft. high, painted with alternate bands of red and white. It is situated on a knoll at the extremity of Cape Campbell, in lat. 41° 43′ 15″ S., long. 174° 18′ 30″ E. The light is a

revolving bright light, attaining its greatest brilliancy every minute, elevated 155 ft. above high water, and in clear weather should be seen from a distance of 19 miles. In coming from the southward, the light does not open till it bears N.W. by N. ¾ N.

Mount Tako is 674 ft. high, and lies 1½ mile to the S.W. of the low extreme of the cape. An encircling dangerous reef of sunken rocks, with some detached and above water, extends nearly a mile N.N.E. of the cape extreme, which is sandy and low; this reef is also continuous 1½ mile to the southward on the seaward face of the cape, extending half a mile from the land. It is advisable, therefore, that vessels should not approach the land in this neighbourhood within 1½ or 2 miles by day, unless coasters acquainted with the dangers; and especially at night, and in thick weather, great caution must be observed when in its vicinity.

The navigation of Cook Strait is easy and less dangerous than the English Channel; and with a good look-out from the mast-head, by day, and the lead going by night, a vessel may proceed to any part of the strait in safety.

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3. MIDDLE ISLAND.

The largest of the New Zealand Islands, and also that containing the greater number of colonists, is 460 miles long N.N.E. and S.S.W., with a breadth varying from 85 to 145 miles, an area larger than England, but widely different in its aspect.

On the eastern and south-eastern sides there is a large extent of open country and comparatively level plains, fit for agricultural and grazing purposes, and being gradually occupied by colonists. The northern part, adjacent to Cook Strait, is much more diversified, while almost throughout its whole length, and towards the north-western coast, is a range of lofty volcanic mountains, which present every variety of grand and picturesque scenery. Towards the South and West is another distinct region, characterised by very lofty irregular mountains, with extensive and very deep lakes lying in the valleys between them. The peculiar characteristics of these interesting regions have been described by Dr. Julius Haast, Dr. Hector, M'Kerrow, Hochsetter, and others, whose works are deserving of all notice.

It is separated into five provinces, *Nelson* on the North, with its chief town of the same name at the head of Blind Bay; *Marlborough*, at the N.E. end, with *Picton*, on one of the arms of Queen Charlotte Sound, as its capital; *Canterbury*, occupying the centre of the island, extending from the East to the West coasts, with Christchurch as its capital, which is 7 miles N.W. of the harbour of Lyttelton. This province was colonized by a Church of England Society in 1860.

Otago lies to the southward of Canterbury. Its capital is Dunedin, at the head of Port Chalmers. It was colonized by some Scotch colonists in 1847, on free church principles. This province has increased in a wonderful degree since the gold discovery, which attracted a very great concourse of immigrants. *Southland* formerly occupied a portion of the southern coast, but now forms part of Otago; *Invercargill*, its late capital, is the outlet of an extensive pastoral district.

The EASTERN COAST.—From Cape Campbell to Banks peninsula, a distance of 130 miles, there is no place of shelter, with the exception of temporary anchorages in fine weather under Kaikora peninsula, and also there are no dangers along that line of coast, extending more than 1 mile from the shore, except 12 or 15 miles South of Awari Bluff, where a bank with 4 fathoms on it is reported to lie 6 or 7 miles from the land. Large vessels, however, are not recommended to approach nearer than 3 miles, at which distance, between Cape Campbell and Kaikora peninsula, the depth of water is 30 fathoms, and at the distance of 10 miles from the shore 80 fathoms will be found. Southward of Kaikora peninsula the water deepens suddenly, and at the distance of 5 miles from the land there is nearly 200 fathoms; while 22 miles farther South, abreast of Waiau-ua River, there is only 30 fathoms at the same distance.

The flood tide sets to the northward, the ebb to the southward, at the rate of nearly 1 knot an hour on this part of the coast, independent of which a northerly set will generally be experienced; but occasionally after southerly winds it has been found to run in the opposite direction.

Between Cape Campbell and Kaikora peninsula rise the lofty and snow-clad mountains known as the Kaikora and Looker-on Ranges. The former are midway between these two points, and 14 miles from the coast; they are 9,700 ft. high, rising in sharp and rugged peaks; the Looker-on Range are 13 miles North of the peninsula, and 7 miles inland, of the same character, and 8,700 ft. above the sea.

The Coast trends from Cape Campbell S.S.W., and is rocky for the first 9 miles to the small river *Waiharakaka*, at the entrance of which is *Flaxburn*, a sheep station, and where, in fine weather, there is landing for boats sheltered by the reefs; there is also temporary anchorage for coasters, with N.W. winds, in 10 and 11 fathoms, 1 mile from the shore. The coast southward of Waiharakaka is sand and shingle beaches, with rocky points, for 22 miles to *Waipapa Point*, and the steep spurs descending from Benmore Mountain, which rises over Flaxburn to a height of 4,300 ft., as well as those from the lofty Kaikora Mountains to the southward, give to the neighbouring coast a peculiarly bold and rugged appearance. Immediately South of Waipapa Point, which is low and projecting, is Waiau-toa or Big River. The break in the Kaikora and Looker-on Ranges formed by the valley of this river has the

appearance of a harbour from a distant offing. Nearly 3 miles South of Big River is a boat harbour and fishery; two white streaks in the wooded cliffs point out the landing place.

KAIKORA PENINSULA is a hummocky tongue of land, 330 ft. high, projecting 2 miles at right angles from the coast, and lies 50 miles from Cape Campbell, forming Ingles or Half Moon Bay on the North, and Gooch Bay on the South, and affording shelter for coasting vessels from north-easterly and south-easterly gales. The Kaikora township, situated on the shores of Ingles Bay, is at present thinly populated (257 in 1881), but promises to be a place of some importance, the country adjacent having been taken up by settlers for agricultural purposes.

Ingles Bay lies between Hapuku River on the North, and the northern point of Kaikora peninsula (Point Kean) on the South. The usual anchorages are well sheltered from the N.N.W. through West to S.E., with good holding ground, in depths varying from 7 to 10 fathoms, but open to N.E. and easterly gales. With north-easters the sea does not rise to any extent, but with easterly gales it is very heavy.

Four beacons have been erected on the cliffs near the sea, as leading marks, two for the outer and two for the inner anchorage. They are painted as follows:—Upper outer anchorage beacon, black and white with white perch, and elevated 105 ft.; lower beacon, red and white with red perch, elevated 95 ft. Upper inner anchorage beacon, red, elevated 55 ft.; lower beacon, white, elevated 40 feet.

Vessels from the northward, making for the anchorage may in ordinary weather steer a course direct for Mount Eyes, which rises from the centre of the peninsula, until within about 2 miles of the shore, when a S.W. $\frac{1}{4}$ S. course for the outer anchorage beacons on the cliffs under Mount Eyes will lead into a good outer anchorage with 10 and 11 fathoms, dark sand, and within a few hundred yards of St. Kilda Rock, taking care to keep Ninepin Rock, which lies to the N.W., open northward of St. Kilda Rock.

Vessels approaching Ingles Bay from the South in ordinary weather, may steer with safety close to Lynch Reef, which lies off Point Kean, the eastern extreme of the peninsula, and haul up on to a course, keeping Ninepin Rock open northward of St. Kilda Rock, and anchoring in any position on that line of bearing. In bad weather it is necessary to give Lynch Reef a wider berth, as a shoal rocky patch of from 5 to 6 fathoms lies N.E. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ cable from the N.E. point of the reef.

Fyffe Cove is a boat harbour, about 6 cables to the westward of Lynch Reef, formed by Observation Point and the projecting reef to the eastward, capable of holding, when properly moored, three or four coasters not drawing above 6 to 8 ft. Vessels making for this inner anchorage must keep the outer anchorage beacons in line until the second set of beacons at the head of the cove are in one, when they should immediately haul up on this new line of

bearing, which will carry them into the harbour, clear of a rock awash lying on the eastern side of the entrance. Care must be taken not to go off the line of bearing for Fyffe Cove, as a dangerous rock with only 6 ft. of water lies between St. Kilda Rock and Observation Point. Moorings are laid down to the rocks on both sides of the harbour. A jetty has also been constructed by the Government to allow of small craft hauling alongside to discharge their cargoes.

Davidson Rocks, lying N.W. by N., and distant nearly 1¼ mile from Observation Point, is a dangerous and shoal patch awash at low water springs. Between these rocks and the shore, and bearing N.W. ½ W. from Observation Point, is another dangerous patch known as *Ruby Shoal*, consisting of two conical rocks lying N.W. and S.E. of each other, 6 ft. apart, with 3 ft. of water at low water springs. To avoid these rocks when working in or out of Ingles Bay, mariners are cautioned not to open Ninepin Rock seaward of Point Kean; they must also bear in mind that the current almost invariably sets to the northward.

Gooch Bay, situated on the South side of the peninsula, lies between Haul-round Point and Kohai or Waite River. The anchorage in the bay is well sheltered from all winds but those between the South and East, good holding ground being found at a depth of from 8 to 9 fathoms, with the southern extreme of Baxter Reef on with Haul-round Point bearing E.S.E. In hauling into this anchorage care must be taken to avoid Cone Rock, nearly awash at low water, lying S.W. of the end of Baxter Reef, and distant about one quarter of a mile.

Bullen Cove, formed by Baxter Reef to the westward, and Haul-round Point to the East, cannot be recommended as a good anchorage.

Amuri Bluff.—For 11 miles southward of Kaikora Peninsula is a continuous bight, the South point of which is Amuri Bluff; it is about 2 miles in depth, and has several outlying rocks nearly a mile from the shore. Small coasters can moor in safety within these reefs. There is very deep water off Amuri Bluff, 184 fathoms having been obtained only 2 miles from the shore. A shoal bank of 4 fathoms is reported to exist 12 or 15 miles South of Amuri Bluff, and 6 or 7 miles off the shore.

Waiau-ua or Dillon River is about 26 miles South of Kaikora Peninsula. It rises in the lofty *Mount Franklin*, 10,000 ft., at 55 miles to the N.W. The entry may be distinguished at a distance by a lofty mountain, *Mount Caverhill*, rising 2,000 ft. above the level of the sea, 7 miles to the northward of the entrance. From its summit the Caverhill Range extends to the southward, terminating abruptly on the northern banks of the Waiau-ua River. The Cheviot Hills form the southern boundary of the river, and are of a hummocky formation. The river has frequently two narrow entrances, one immediately at the base of the Cheviot Hills, and the other about half a mile North

of this, on a shingle beach; both entrances are shifting, and the velocity of the stream on the ebb is so rapid as to render it dangerous for boats.

No outlying dangers exist off the mouth of the Waiau-ua River, which can be approached boldly to within half a mile, in a depth of 4½ to 5 fathoms, but vessels should not anchor in less than 6 fathoms, as the sea breaks some distance from the land in southerly and south-easterly breezes.

Gore Bay is an indentation of the coast line, situated between Waiau-ua and Hurunui Rivers; the latter is only fit for boats. The country in the neighbourhood, known as the Cheviot Hill Station, is one of the finest grazing districts in New Zealand; difficulties of shipping the wool, on account of the exposed nature of the coast, are very great.

An organized boat establishment of Kanakas, from the Sandwich Islands, is maintained here to man the surf-boat. The present landing-place is on the sandy beach lying between McClellan Point and Jed River. There is not more than a quarter to half a fathom of water, when it suddenly dips to 1½ and 2 fathoms. With any swell from seaward the sea breaks over this shoal ground with great violence, and in gales from the S.E. it has frequently been known to break nearly as far seaward as the general trend of the coast line in 5 fathoms water.

Every convenience for landing has been organized, a warping-buoy being laid down for hauling the boats in and out through the surf; the landing, however, should never be attempted excepting in a whale-boat. The roadstead is only available for small coasters.

Sail Rock lies close off a projecting cliffy piece of coast, 4 miles southward of Hurunui River; 8 miles further to the S.W. is *Motunau*, or the Table Island of Cook, which, like Sail Rock, has a white appearance in bright weather. *Table Island* is small, lying three-quarters of a mile from the shore, and almost connected with it by reefs; there are also reefs extending nearly a mile to the eastward and southward, and a rocky patch, with 4 fathoms, 2 miles S.W. by S. of it. The island affords shelter for boats.

From Table Island the coast recedes to the westward, becomes low and sandy, and forms Pegasus Bay, the South side of which is Banks Peninsula. The shores of this bay form the sea face of the northern portion of the great southern or Canterbury Plains.

PEGASUS BAY is nearly 40 miles in extent, North and South, and 15 miles in depth. Its northern shore, from Table Island to Double (or the N.W.) Corner, a distance of 12 miles, is cliffy, with a sandy and stony beach at low water; 4 miles westward of the island are two shallow patches, extending a mile from the shore; they should be avoided, and are the only dangers in Pegasus Bay. From *Double Corner*, where there is good boat landing in fine weather, a sandy beach extends for 27 miles or nearly to the entrance of Port Lyttelton.

Waimakarairi River entrance bears from Godley Head N.W. by N., dis-

tant 12 miles. There is a bar, which is constantly shifting and varying in depth. A signal-staff (see p. 349) stands on the highest sand-hill immediately to the southward of the entrance, and two moveable beacons are placed on the South spit, and kept in one as nearly as possible with the deepest water over the bar, which has generally about 3 ft. on it at low water spring tides. Vessels of 40 tons can ascend about 8 miles to Kaiapoi; the navigation of the river inside is easy, and the channel well staked. *Kaiapoi*, 12 miles northward of Christchurch, is joined to it by railway. It had a population in the town itself of 1,221 in 1881, and including the district, 6,896.

Avon River (*Opawaha*).—The entrance of this river lies at the South extreme of the sandy beach of Pegasus Bay. As a means of conveying cargo between Port Lyttelton and the plains, it is of great importance to the Canterbury Settlement, and in moderate weather is accessible to vessels drawing from 8 to 10 ft. of water. The bar is one-sixth of a mile outside the rocks above water off the southern entrance point, and has a depth in the channel of not less than 5 ft. at low water springs, but requires local knowledge.

On Cave Rock, at the entrance to Avon River, stands a signal staff, on which are exhibited the New Zealand Signals, as described on p. 349, and vessels are piloted in by means of semaphore arms. Vessels of 40 tons can enter safely at the proper time of tide, and then ascend the river to the ferry, and smaller craft to the quay within 2 miles of Christchurch. Small steamers run between Lyttelton and Christchurch; under favourable circumstances the bar may be crossed in open boats with perfect safety.

CHRISTCHURCH, the capital of the Province of Canterbury, is situated on the River Avon, 5 miles from the sea. It is connected with Port Lyttelton by a railway 7 miles long, constructed at great expense through the hills. Railways also extend northward and southward of Christchurch; the southern line to Invercargill and Bluff Harbour, 386 miles, passing near the coast, through Timaru, Oamaru, Port Chalmers, and Dunedin. The population of the city was 15,213 in 1881, and including the suburbs 30,719. The surrounding district is chiefly suitable for grazing purposes.

BANKS PENINSULA is one of the most remarkable projections in New Zealand. When Captain Cook passed here in his first voyage, it was at so great a distance that he considered the isolated mass of hills, of which it consists, to be an island, and named it Banks Island, from Mr. (afterwards Sir Joseph) Banks. Subsequently it was ascertained that a level tract of land united it to the main island, but this too was much misrepresented, and it was not until the surveys in 1849-50 that its true character was ascertained. It is about 20 miles long, E.S.E. and W.N.W., and 17 miles broad, consisting almost entirely of steep rugged hills, about 2,000 ft. high, covered with wood. Several important harbours penetrate deeply into it on all sides. The land is nearly all settled by small farmers, the peninsula being noted for its dairy produce; this, with wool, forming the main export.

From the remarkable appearance of this apparently isolated land, there is no possibility of a vessel mistaking her position; and the navigator will derive considerable confidence in approaching at night, as the bank of soundings extends 25 miles from the coast, a feature almost peculiar to this part of New Zealand.

PORT LYTTELTON (*Tewhaka*), formerly called *Port Victoria* and *Port Cooper*, lies on the N.W. side of Banks Peninsula; its entrance being 2½ miles from the South end of the sandy beach of Pegasus Bay. It runs in a S.W. by W. direction, 7 miles. The town of Lyttelton, with a population of 4,127, in 1881, is situated on the North shore in a small bay, 4 miles from the heads; above it there is only sufficient depth of water for small coasters. Ships drawing 15 ft. can lie alongside the railway jetty at Port Lyttelton. A railway is tunnelled through the hills to Christchurch, as before mentioned. In 1880, the exports amounted to the value of £1,525,416. *Water* is supplied from artesian wells.

A *Time-ball* is dropped from the Telegraph office, at 1^{h} p.m., New Zealand mean time. (*See* note on p. 430.)

Moles have been constructed extending from Officer and Naval Points, the enclosed space, 110 acres, being dredged to a depth of 17 to 23 ft. at low water; it is intended to further deepen this until a general depth of 20 ft. at low water is attained. There is a width of 550 ft. between the mole heads, with a depth of 16½ ft. in mid-channel. Vessels within the moles are sheltered from S.W. winds. There are 8 sets of moorings in the harbour, with several commodious wharves and jetties. A graving dock is also under construction, 450 ft. long, with an entrance 46 ft. wide, and a depth of 23 ft. over the sill.

Light.—A light is exhibited from a lighthouse on *Cachalot* or *Godley Head*, at the North side of the entrance to Port Lyttelton. The light is *fixed bright*, visible through an arc of 200°, when bearing between W. ¼ N. and S.E. by S. ¾ S., round by West and South. It is elevated 450 ft. above high water, and is consequently liable to be obscured by fog, but in clear weather should be seen from a distance of 29 miles. The lighthouse is 30 ft. high, standing on the edge of the dark red cliff of Godley Head, and from the eastward it makes as a small square white house, with a hill in the back-ground.

At the foot of the western side of Toloa or Adderly Head, in Little Port Cooper Bay, stands the *Pilot Station*. A look-out is kept day and night; and vessels requiring a pilot after dark should, when between the heads, burn a blue light, or show a flare-up, and the signal will be promptly answered by the pilot, unless engaged with another vessel, in which case a ship may with safety proceed up the fairway of the harbour, and anchor below the shipping in 5 fathoms. The harbour pilot will shift her at daylight to a proper anchorage.

Signal Stations have been established on the hill above Toloa Head, and at the Observatory, a dark red building faced with white stone, whence all vessels are signalled

In approaching the harbour from the northward, *Mount Herbert*, the highest peak of the peninsula, is a prominent mark, Port Lyttelton lying to the westward of it. On a nearer approach, *Mount Pleasant*, the highest peak on the North side of the harbour, is easily distinguished, being bluff towards the port, and sloping off gradually to the low land of the plain. *Coopers Knobs*, at the head of the harbour, are remarkably round, wooded, overhanging peaks, and form a leading mark for steering up the harbour, with the house on Quail Island under them bearing S.W. by W.

Vessels from the southward, after rounding the peninsula, should keep along the land, about 1½ mile off, until they open out Ports Lyttelton and Levy.

There is good anchorage outside in calm or southerly weather; soundings from 7 to 10 fathoms 4 or 5 miles from the shore.

The entrance to the port is 1 mile wide, and it maintains the same width as far as the anchorage off Lyttelton. The entrance heads are bold and steep-to, and have 8 fathoms between them, which depth decreases gradually to 3½ fathoms at the anchorage. There are no dangers on either side in working up, with the exception of a small detached pinnacle rock with 8 ft. on it at low water, which lies in a N.N.W. direction from Ripa Islet (near the South shore, 2¾ miles within the heads), and is 1⅛ cable from the shore. A small *red buoy* has been placed on an outlying detached rock of 14 ft., about 30 yards outside the 8-ft. rock. A *Quarantine Station* has been erected on Ripa Islet.

Port Lyttelton is easy of access in most weathers, except in S.W. gales, which draw out with great violence. It is somewhat open to easterly winds, but gales from that quarter are not of frequent occurrence, N.W. and S.W. being the prevailing winds.

Immediately within *Toloa* or *Adderly Head*, the South entrance point, which is bold, and perpendicular, there is a small bay (*Little Port Cooper*), which whale ships formerly frequented for water, &c.; but it is open to northerly winds. On its S.W. side, the landing place of the submarine telegraph cable is marked by a vertical white mark, which is conspicuous from seaward for a distance of three or four miles.

Quail Island, connected at low water with the main land, also lies on the southern side of the port, opposite Lyttelton, and 1½ mile distant from it. Midway between this island and the town *Shag Reef* will be seen, having a rock about 8 ft. high at its West extreme; a *red* buoy lies in 15 ft. water at nearly a cable East of its East extreme.

Vessels of large tonnage should anchor fully three-quarters of a mile outside Shag Reef, at a distance of little more than half a mile from the jetty, in 3½ fathoms at low water. The eastern or outer end of the town should not be opened out. "The holding ground, although mud, is of such a treacley consistency, that during strong breezes ships nearly always drag their anchors, slowly but surely, through it. H.M.S. *Challenger* dragged nearly a cable in 36 hours, with 50 fathoms of chain out and a clear anchor; while merchant

ships dragged much further. I feel convinced that no vessel would hold in this port during a strong N.E. gale; the sea would then break in 5 fathoms."—*Nav.-Lieut. H. Y. Slader.*

There is very little tide felt in this and the adjacent harbours. It is high water, on full and change, at $4^h\ 20^m$; springs rise $7\frac{1}{2}$ ft., neaps 4 ft.

PORT LEVY, or Albert (*Koko-rarata*), is close to the eastward of Port Lyttelton, the South head of the latter (Toloa) forming its western entrance point. The port runs in a due South direction for little more than 3 miles, and is three-quarters of a mile wide at the entrance, narrowing gradually within. It is free from dangers, with the exception of some straggling rocks which extend about half a cable off its western shores, and which in working in must be avoided. The holding ground is good, but the port is open to northerly winds. The upper part of the harbour is shallow, and only fit for small coasters.

Baleine Point, the eastern entrance point, is rocky, but not high, and has a rock above water extending about half a cable off it, on which is an iron *beacon* staff and cage. There is also a rock lying off the point, a quarter of a mile further to the eastward. A detached conical rock, with a sunken rock a short distance outside it, lies $1\frac{1}{2}$ cable off shore 1 mile to the south-eastward of Baleine Point.

Pigeon Bay (*Wakaroa*), which is very similar in feature to Port Levy, and situated $2\frac{3}{4}$ miles to the S.E. of it, runs in a parallel direction for nearly 4 miles, being separated from it by a ridge of hills between 1,500 and 2,000 ft. high. It is equally easy of access; but the deep water runs further up, as vessels may anchor in $3\frac{1}{2}$ fathoms, $2\frac{1}{2}$ miles within the entrance. The eastern entrance point, *Wakaroa*, has some rocks lying nearly a cable off it, and a sunken rock has been reported to exist, lying from $1\frac{1}{2}$ to 2 cables due North of Pigeon Point, the western entrance head, but otherwise it is entirely free from dangers. This port was formerly a favourite resort of whale ships.

Between Pigeon Bay and the eastern extreme of Banks Peninsula, a distance of 15 miles, there are several small bays and bights, the principal of which are Akaloa, Oken, and Bone Bays; they are each little more than a mile in depth, and about half a mile in width. The coast between them is steep and ironbound. *Akaloa* is a double bay, rocks extending from the middle head to the N.W., almost closing the western portion. In September, 1863, the ship *Catherine* is said to have struck on what was supposed to be a pinnacle rock, lying three-quarters of a mile off the N.E. extreme of *Longlookout Point*, the western point of the bay, or half a mile outside the rocky patches marked on the chart. Vessels are cautioned, until the dangers off this salient point of the coast are further examined, to give it a berth of at least a mile in passing.

Sail Rocks are a detached cluster standing a third of a mile off the coast, near the East point of Oken Bay. *Bone Bay* is nearly at the eastern extreme of Banks Peninsula, being 2 miles North of East Head. It runs in a West

direction, and has anchorage nearly a mile within the entrance in 4 fathoms. Neither of these bays can be considered as eligible for anything but small vessels.

AKAROA HARBOUR is similar to the others on the North side of the peninsula, except that it runs in an opposite direction. Early in 1840, the first emigrants of the Nanto-Bordelaise Company, a French Association to colonise Banks Peninsula, arrived in the Bay of Islands. But the English government there established took the precautionary measure of proclaiming English sovereignty in Middle Island a few days previously.

"Akaroa, for safety of anchorage, gradual depth of water, and especially for picturesque scenery, has long been recognised as one of the gems of the colony. It is a magnificent port, affording secure and landlocked shelter to any number of vessels, and was for many years the favourite resort of whalers. The town is divided into two portions: the lower town, from having originally been peopled by the French, is called French Town; the more modern and higher is named English Town. This harbour has not yet come much into use."—*Illustrated Australian News*, 1875. A railway, 38 miles in length, is under construction to connect it with Christchurch. The population, in 1881, numbered 611.

The harbour, though a noble one, was not so much frequented by whaling ships as might be inferred from its position, because the violent flurries of wind, from the high headlands surrounding it, render its narrow entrance rather difficult, and even dangerous with S.W. winds.

The heads of Akaroa Harbour are remarkable; the eastern head (*Trueni*) is much the highest, and at 2 cables distant from the shore lies a black rock, 20 ft. high, in shape and appearance like a long boat. *Iron Head*, the western (*Timatim*), is a perpendicular cliff of a dark gray colour; detached rocks, 15 feet high, extend southward of it, and others outside them, on which the sea breaks, extend nearly 3 cables from the shore. The breadth of the entrance is about three-quarters of a mile, and this is the narrowest part of the harbour.

LIGHTHOUSE.—On *Akaroa Head*, eastern side of entrance to the harbour, is a white wooden lighthouse, 28 ft. high, from which is shown a *flashing bright* light, with a flash every 10 seconds, elevated 270 ft., and visible 23 miles in clear weather.

Wright Rock lies S. by W. half a mile from the South head of Akaroa Harbour; it is pinnacle-shaped, has about 11 ft. water over it at low water, and only breaks in a heavy sea. No kelp marks the locality.

It is not thought prudent to enter with a S.W. wind, as baffling and heavy squalls rush down from the high lands; in moderate weather it is considered perfectly safe and easy of access. The depth of water inside the heads is about 14 fathoms.

Vessels should not anchor until above Nine-fathoms Point, which is 2½ miles

inside the heads; outside this there is generally a swell, the depth from 14 to 10 fathoms, and the holding ground not good; above this point the depth decreases gradually from 9 to 6 fathoms, and in Pakaeriki Bay there is excellent anchorage, in 4 fathoms at low water, little more than half a mile off the settlement. A reef of rocks, awash at high water, extends little more than a cable off Observation Head, the South or outer point of this bay, and is marked by a *red buoy* on its extremity; otherwise there are no dangers.

Running along the eastern part of Banks Peninsula, the current will be found setting to the northward. The entrance to the Harbour of Akaroa may be known by the lighthouse, and a heap of large, flat, black rocks, which are off the northern part of the entrance. From the entrance to the anchorage is a clear passage of about 5 miles, from 1 to 1½ mile wide, and in one part, about one-third of the way up, not more than three-quarters of a mile; there is no anchorage for the first 2 miles within the entrance, being open to the sea, the bottom rocky, and the water from 15 to 20 fathoms deep.

To the westward of Akaroa Harbour are two or three small bays on the coast, *Hikurangi*, *Pirangi* (or Piraki), and *Oihoa* (go-ashore). The anchorage near them is bad, and completely exposed to the southerly gales, which often blow with great violence. At the westernmost of these, which is at the commencement of the shingle spit forming the Waihola Lake, is a lake (*Lake Forsyth*) which enters the peninsula in an E.N.E. direction.

The "NINETY-MILES BEACH" commences here. It is a continuous range of uniform shingle, without headland or bay, trending to the south-westward of Banks Peninsula. For 17 or 18 miles to the West of Oihoa the shore is composed of a shingle bank, about half a mile broad, which separates the great *Lake Waihola*, or rather *Waiora*, called in the Canterbury survey *Lake Ellesmere*. This has an area of 74,000 acres, and occupies a large portion of the low isthmus which connects Banks Peninsula with the main. This lake communicates with the sea by a narrow opening through the shingle spit, near its western end, which is closed for five or six months of the year.

To the S.W. of this end of the Waihola Lake the shingly beach continues for 60 miles, backed by grassy plains, extending to the foot of the principal ridge of mountains, the site of the Canterbury settlement. Several small rivers enter the sea along this coast. At about 33 miles beyond Timaru, still along the shingly beach, we come to the Waitangi River.

TIMARU.—At the extreme of the Ninety-miles Beach a rocky projection from the coast occurs, named Timaru, 1½ mile N.W. of Patiti Point, the site formerly of an old whaling station, but occupied by a flourishing town of 3,917 inhabitants in 1881, with a large surrounding grazing and agricultural district, through which the railway passes to the southward. The mountain ranges approach here near the coast.

The coast line from Banks Peninsula to Timaru is low, and cannot be seen in thick weather or by night, until close in with the breakers, while to the

southward of the town of Timaru the cliffs are from 30 to 50 ft. high; this is a sure guide to Timaru, viz., low shingle beach to the northward—moderately high cliff to the southward.

A vessel can safely stand off and on, on this part of the coast, by keeping outside a depth of 7 fathoms. If the weather is clear, the high mountain range will be seen behind Timaru long before the coast line has risen; and Burke's Pass, a remarkable gorge, almost directly behind Timaru, is a good landmark, showing a distinct gap. There is a small town a short distance to the North of and in sight of Timaru, but the cliffs before mentioned will prevent any mistake.

Vessels bound for Timaru, after rounding Banks Peninsula, should steer S.W. by W., southerly, unless the wind be strong from E.S.E., which causes an inset, when it is necessary to keep three-quarters of a point more southerly.

A flagstaff and storehouse point out the landing place—which is said to be good—on the open beach at Timaru; from thence a rocky line of coast extends a long mile S.S.E. to the projecting Patiti Point. This shore is fronted by sands and shoal patches, with outlying reefs of rock and kelp always breaking, the reefs extending nearly two-thirds of a mile direct to seaward from Patiti Point, and 1½ mile to the S.E. from the storehouse at Timaru. A breakwater is being constructed to afford shelter for shipping.*

Lights.—At Timaru is a lighthouse, 30 ft. high, painted stone colour; from it is shown a *fixed* light between S. by E. ¾ E. and N. by W. ¾ W., elevated 85 ft., and visible 14 miles. It shows *green* seaward between East and S.E., and *bright* in other directions.

Two *fixed red* lights, elevated 18 ft., and placed 10 ft. apart, are shown on the extremity of the breakwater, and are visible about 4 miles.

Ships' boats should never be used for landing, as the amount of surf on the beach cannot be judged from seaward. In bad weather a look-out is kept on shore. By night, should a vessel part or be in danger of dragging on shore

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* Signals.—In addition to the general signals for the colony described on page 349, the following local signals are used as required:—

A ball at one yard arm, and one on mast, half the length of the yard below the yard—Wait till the tide ebbs.

A ball at each yard arm—Vessel may stand in safely.

Two balls at each yard arm, one below the other—Vessels may stand in safely; a boat will put off.

Two balls at one yard arm (one below the other), and one ball at the other yard arm—Anchorage not safe; keep to sea.

When vessels at anchor should put to sea, the general signal "Put to sea" will be shown.

No. 2 Marryatt's Code over second distinguishing pennant at mast head—The vessel is running into danger.

At night, when it is intended that vessels at anchor should put to sea, two guns will be fired, in addition to shewing the proper lights.

(as a last resource) slip and run her on the beach as near Le Crens Gully (to the North of the town) as possible; let the hands remain by the wreck, and assistance will be given by means of a rocket fired over the vessel.

WAITANGI RIVER runs from West to East, through a vast plain of 40 or 50 miles in length, and about 12 miles in width, stretching East and West, without tree or shrub. It is a deep and rapid torrent, rushing through a labyrinth of gravel banks and small islands, and in summer much swollen by the melting of the snow on the mountains in the interior. It is the natural division between the settlements of Canterbury and Otago.

From Waitangi River the low cliffy coast with shingle beach continues for 15 miles to *Cape Wanbrow*, a projecting bluff of moderate height; from thence it assumes a different aspect, being broken into sandy or shingle bays, with cliffy points between.

Light.—On Cape Wanbrow a *fixed red* light is shown seaward between N. by E. and S.S.E., and is said to be visible about 15 miles.

OAMARU.—Close to the northward of Cape Wanbrow is Oamaru, a safe anchorage with all winds excepting those between N.N.E. and S.S.E.; the anchorage is about two-thirds of a mile to the westward of the bluff headland to the southward of the town, in a convenient depth of water about half a mile from the shore. Cape Wanbrow bearing S. by W. indicates the outer anchorage. Heavy moorings were laid down for large vessels; coasters use their own ground tackle. There are two boat establishments at this place. In case of bad weather being expected, danger signals (page 349) are shown from a flagstaff on the cliff immediately South of the breakwater.

Some extensive works are, however, now nearing completion, which will afford shelter to vessels of large draught. A breakwater about 2,000 ft. long, with a mole 1,700 ft. long carried towards it from the beach on the North, will shelter a harbour, which can be deepened to a mean depth of 17 ft. at low water. A channel will be dredged, with a basin near the inner wharf, to a depth of 22 ft. at low water.

The town has an imposing appearance from the sea, and had a population of 5,791 in 1881. It is the shipping port of the largest pastoral and agricultural districts in the province, and has an immense export of agricultural produce. Good building stone and coal exist in the vicinity. Besides being on the main line of railway from Christchurch to Invercargill, it also has two branch railways into the interior. It has good wharves, on which are two steam cranes.

Light.—A *fixed green* light, elevated 16 ft., and visible 3 or 4 miles seaward between N.N.E. and S.E., is shown from a staff on the North end of the breakwater; in bad weather it cannot be shown.

About 5 miles to the S.W. of Cape Wanbrow is *Kakanui River*, at the mouth of which a harbour has been formed, with some large storehouses. There are some meat-preserving works at Kakanui, which had a population of 300 in 1881.

Moerangi Bay.—Look-out Bluff (*Awa-Mokihi*), 11 miles southward of Oamaru, is the North point of this bay, Whalers Home Point, 5 miles to the southward, being its southern extreme. A reef, nearly 3 miles long, covered with kelp, extends nearly across its entrance from North to South, and is a great protection to the boats of a whaling establishment, situated at its southern end.

Whalers Home Point is the eastern extreme of Moerangi Peninsula, a cliffy projection, and is nearly 3 miles in length, with a sandy cove on its South side, forming a good boat harbour. A small islet (White Islet) and some scattered rocks, under water, covered with kelp, lie half a mile off the northern part of this projection; and $1\frac{3}{4}$ mile eastward of its southern extreme is *Fish Reef*, which extends in a N.W. and S.E. direction for 1 mile, and uncovers at low water, being well marked at other times of the tide by kelp. This reef has deep water close outside it. There are several houses on the summit of Whalers Home Point.

Light.—On the South point of Moerangi Peninsula is a white wooden light-house, 28 ft. high, from which is shown a *fixed bright* light, elevated about 170 feet, and visible 19 miles in clear weather.

From Moerangi Bay southward the country is hilly, and wooded close to the coast; a sandy bay extending for 5 miles, the South extreme of which is *Vulcan Point*. Shoal water extends 2 miles South of this point, at the extreme of which is *Danger Reef*, a sunken rock, whose position is also marked by kelp. Three very remarkable mountain cones rise just to the southward of Vulcan Point, 2 or 3 miles from the coast, and in their vicinity, at the mouth of *Shag River*, *coal* of good quality is worked; in 1881 the total output amounted to 28,673 tons. At 6 miles above the colliery is the town of *Palmerston*, having a population of 968 in 1881.

Waikouaiti Bay is 17 miles southward of Whalers Home Point, and 10 miles North of Port Chalmers. There is anchorage in the bay with off-shore winds; 5 fathoms will be found within half a mile of the shore. Waikouaiti or *Hawksbury* town, on the shores of the bay, contained a population of about 600 in 1881, and including the surrounding district and Shag Valley, 5,323. The railway passes by it.

Ahuriri Rock lies about three-quarters of a mile from the shore, and 2 miles northward of Jones Head (so named from an influential settler here), the North point of Waikouaiti Bay; it has 5 ft. water on it at low water, with 2 to 4 fathoms immediately round. From it Remarkable Cliff, near Tairoa Head, bears S. by E. $\frac{3}{4}$ E.; Vulcan Point, N. by E.; and Harris Bluff, S.W. by S. $\frac{3}{4}$ S. Vessels should not approach the coast between Vulcan Point and Jones Head within $2\frac{1}{2}$ miles, as it has not been examined near the shore, and is considered foul.

Between Waikouaiti and Otago Heads the coast is steep, so that the path between them lies over the hills. At a spot called *Blueskins*, 6 miles from

Otago Heads, two or three settlers formed an establishment in 1848; in 1881 the population was about 300.

PORT CHALMERS (Otago).—In 1843, in consequence of the dissensions among the religious parties in Scotland, an association was formed by the members of the Free Church of Scotland, to form a settlement in New Zealand; and, on their application, Port Cooper (now Port Lyttelton), on Banks Peninsula, was assigned to them. On a subsequent exploration, in 1844, *Otago* or *Otakou*, was determined on as the site for the future colony. The first expedition of colonists sailed from England in December, 1847, and arrived in March, 1848.

Dunedin, the capital of Otago, and most important commercial city of New Zealand, is situated at the head of the bay, about 8 miles from Port Chalmers, with which it is also connected by a railway. Its importance was greatly increased by the discovery of gold in the province in 1861, since which time the value of the precious metal exported has been nearly one-half of that exported from the whole colony. In 1880 the value of all the exports amounted to £1,644,951. The population of Dunedin and its suburbs, in 1881, was 42,802. The railway from Christchurch to Invercargill passes Port Chalmers and Dunedin. In 1883, vessels drawing 16 ft. were able to reach Dunedin, the channel being greatly deepened by the dredging now in progress. Wool, flax, and preserved meats are the principal exports.

Lying open to the North, Port Chalmers is entered with a fair wind from the other settlements of New Zealand and from Australia. This also prevents any delay at the heads on leaving. A fair wind out of the harbour takes a vessel soon free of the land, and, if seized at the commencement, may carry a ship of average sailing qualities to Cook Strait in 48 hours. With southerly winds a current is experienced in this vicinity setting to the northward at from 1 to 2½ knots an hour.

The general direction of the harbour is to the S.W. The entrance is narrow, a little more than a quarter of a mile only; and as there cannot be short of 30 square miles of tidal water within, the current at the mouth is strong.

The approach to this port from the southward is well denoted by Cape Saunders and its remarkable insulated mountain, 1,410 ft. high. From the northward and eastward it will be known by the gap its entrance makes in the land, as also, in hazy weather, by a remarkable bank of dazzling white sand heaped at the base of the steep cliffs forming its western entrance head. This bank of sand from a distant offing is frequently mistaken for breakers on the bar.

As Port Chalmers is a barred harbour, there are times when it would be imprudent and unsafe to attempt to enter. The signals described on page 349 are used. The Signal Station is on Tairoa Head, under the care of the pilots, whose boat's crew are stationed here, and at all times ready to push out when the bar is passable. The harbour authorities here have lately imported a

powerful dredger, with which it is proposed to dredge a channel over the bar, so that vessels drawing 23 ft. might safely enter the harbour.

The entrance to the port lies North and South. *Tairoa*, its eastern head, is a bold, dome-shaped, rocky headland, 244 ft. high. From this head the bar extends in a north-westerly direction towards *Hayward Point*, which is the northern extreme of a bluff precipitous headland, forming the western entrance head of the port.

LIGHTS.—Tairoa Head Lighthouse is a white tower, 39 ft. high, showing a *fixed red* light, visible from seaward when bearing from W. ¾ S., round by South, to S.E.; and up the harbour when bearing from E. ½ N. to N.E. ¼ E. It is elevated about 196 ft. above high water, and in clear weather should be seen at a distance of 20 miles. In foggy weather a *gong* is sounded every 15 seconds.

On the sand-spit extending from the western shore of the harbour are two *beacon* towers, 300 yards apart N.N.E. and S.S.W., from which lights are shown at night. The upper or inner light is *fixed green*, elevated 36 ft.; and the lower or seaward light is *fixed bright*, elevated 26 ft.; they are both shown through an arc of 75° between N.W. ½ N. and N.E. by N., and are visible 6 or 7 miles, and in line lead over the bar.

At the Pilot Station inside Tairoa Head a small *fixed red* light, not visible seaward, is shown on the red and white beacon. Inside the inner bar a *light-vessel*, showing a *fixed bright* light, is moored in 12 ft., on the South side of the flat extending from the sand-spit, and about 2 cables S.W. by S. from the first red beacon.

Within the entrance a spacious sheet of water extends to the south-westward for a distance of 11 miles, and at the head of this arm of the sea stands the town of Dunedin. Seven miles within the heads a prominent headland, with two adjacent and lofty islands, on which are the Quarantine buildings, extending across the harbour, form a natural division; above which, the channel is being dredged to admit of large vessels proceeding up to Dunedin. A mile eastward of these midway islands is the town of Port Chalmers, at the head of Koputai Bay, where there is good anchorage for large vessels in 5 fathoms.

On a reference to the plan of this harbour it will be observed that, when within the bar, the ship channel leading to Koputai Bay is deep but narrow, extensive sand-banks filling up the central space of both divisions of the harbour. This channel is marked by a series of temporary beacons and buoys; but, as a stranger should not proceed without a pilot beyond the first anchorage within the entrance, the directions here given will not enter into detail beyond that limit.

The Bar extends 1 mile in a N.W. direction from Tairoa Head; it is composed of hard white sand, and is in parts an extremely narrow ridge, difficult to touch upon with the lead, with a fathom deeper water on either side. The depth of water on it varies, being a little deeper after the winter gales (July

and August), which blow from the S.W., and is considered by those locally acquainted with it to be gradually shoaling. As before stated, it is proposed to dredge a deep channel across it.

The channel across the bar having gradually regained the deeper water it had before the great tidal wave of August, 1868, caused it to shoal, two white beacon towers are now erected on the sand-spit extending from the western shore of the harbour, to lead over it. The greatest depth on it is about 3 fathoms at low water.

The harbour should not be approached in a S.E. gale, for these winds set the heaviest sea in on the coast, and produce a frightful surf on the bar, which breaks in 5 and 6 fathoms; neither should the bar be attempted on the ebb tide, unless with a commanding breeze, as it sets strongly towards Hayward Point. Light south-easterly winds also, which are generally accompanied by a light sea fog, cause a troubled swell on the bar, which is not the case with those from the N.E., to which quarter it is more exposed. A strong N.E. wind with the ebb tide makes a broken bar, dangerous for boats, but the swell goes down at all times very quickly, particularly with westerly winds.

The information in the three following paragraphs is by Capt. W. Thompson, harbour-master, 1876.

Pilots board vessels within a radius of 3 miles from Tairoa Head, unless the sea on the outer bar renders it unsafe for a boat; this, however, seldom occurs. If unsafe, then the pilot-boat is placed in mid-channel inside the bar, and shows the pilot-flag, for which the vessel must be steered as soon as the red and white beacon at the pilot station opens out to view. If the wind be strong and northerly, the vessel should run in under easy sail, to enable the pilot to board in safety, as there is not room to round a vessel to in the channel. If the wind be northerly, or if it be necessary to wait for daylight, for tide, or for a pilot, stand off and on, and do not bring the lighthouse to bear to the eastward of South; a vessel will thereby benefit by the northerly current, and keep to windward.

The outer anchorage is safe when there is no easting in the wind. Small vessels should keep as near the line of the leading lights as convenient, in 9 fathoms, about half a mile from the shore; and large vessels about 1½ mile off shore in 15 fathoms, with Tairoa Head lighthouse bearing South.

The inner anchorage is between Howlett Point and the first buoy on the inner bar, and is safe in any weather. For vessels anchoring below Harrington Point, the nearer they are to the sand-spit the better; and above the same point they should get into the bight a little, abreast of the old native village. Only vessels of a light draught can work into the inner anchorage. When working out on the ebb, care must be taken not to stand too close over to Hayward Point, as the tide and swell set in that direction.

In the event of it being necessary to run in, and the state of the bar such as to prevent the pilot crossing it, the following directions, agreeing with the

survey of March, 1879, should be observed:—The marks for crossing the bar lead 2¼ cables outside Tairoa Head. They are the two beacon towers on the sand-spit extending from the western shore of the harbour, or the lights shown from them, brought in line, and bearing S.S.W., which will lead over the bar in 15 ft., at low water springs; and when the red and white beacon at the Pilot Station on Tairoa Head opens of Howlett Point, a course may be steered for Harrington Point, passing midway between it and the sand-spit. At night the *green* light open North of the *bright* light, S. by W. ½ W., leads over the bar in 16 ft. least water.

Harrington Point, the first rocky point half a mile within Tairoa Head, may be passed at half a cable, being quite steep-to; the width between it and the low dry spit of sand on the opposite shore being scarcely 2 cables. A mid-channel course may then be shaped for the first buoys which are laid down on an inner sand flat leading to the ship channel for Koputai Bay, anchoring 1 or 2 cables to the northward, or midway between them and Harrington Point, in 5 to 8 fathoms. To proceed over the inner bar, continue a mid-channel course between the buoys on it—leaving the *red* buoys on the starboard hand, and the *black* buoys on the port—and leaving the lightship on the starboard hand about 70 yards distant. The channel thence to Dunedin is well marked by buoys and beacons, red on the starboard side, and black on the port. The channel across the inner bar (1½ mile within Harrington Point) shifts occasionally, but on every change the buoys are altered so as to denote the 2-fathoms edge, the depth in the middle of the channel being 17 ft., in 1876.

North Channel.—It must be observed that in smooth water, with a commanding breeze, there is an available channel within the bar, between it and Hayward Point, with from 19 to 20 ft. least water, in 1879. Vessels intending to take it should bring the entrance of the harbour between Harrington Point and the low sand-spit opposite it open on a S.E. ½ S. bearing, and sail in on this course. When the signal-staff bears E.S.E., they should haul up midway between it and Harrington Point, until in the deep channel in 6 fathoms, and then proceed as before directed. In taking this channel, vessels are generally exposed to the swell abeam.

Driver Rock.—The only danger outside the line of the bar is this rock (named after the pilot), with 7 ft. at low water; it lies N.E., 1⅛ cable from the N.E. extreme of Tairoa Head, and is out of the track of vessels crossing the bar, but dangerous for small vessels hugging Tairoa Head on that bearing.

Hydra Reef, reported to lie about 4 miles south-eastward of Tairoa Head and a mile off shore, is considered not to exist.

Tides.—It is high water, on full and change, at Tairoa Head, at $2^h\ 50^m$; in Koputai Bay at $3^h\ 30^m$; and at Dunedin at $4^h\ 30^m$. The mean rise at high water at the heads is 4 ft. 9 in., which will give in ordinary tides a depth sufficient for vessels drawing 22 ft. to enter. The rise at Dunedin is from 2 to 4 ft.

Port Chalmers.—This town, the port of Dunedin, and situated on Koputai Bay, had a population of 2,181 in 1881, and has several commodious piers and jetties. The *Dock*, opened in May, 1872, was constructed of stone found in the neighbourhood, at a cost of £56,000. It is capable of taking any vessel likely to enter Port Chalmers, until the bar entrance deepens considerably. A channel has been dredged through the bank to the entrance, and is in course of being deepened. There are also extensive workshops and machinery in connection with the dock, the dimensions of which are :—Length over all, 330 ft.; breadth of entrance, 68 ft.; breadth for ship's bilge, 43 ft.; depth over sill at ordinary spring tides, 21 ft., at neaps, 17½ ft. There is also a floating dock, 150 ft. long, capable of taking up vessels of 400 tons.

The railway pier at Port Chalmers is 1,000 ft. long, at which vessels of 2,500 tons register have discharged, besides which there is another pier. They have a depth of 13 to 21 ft. alongside, with sufficient length to berth nine large vessels.

It is stated that a *Time Ball* falls at noon every day. It is established along with a Signal Station (see page 349) on the hill on the West side of the town. From a flagstaff at Port Chalmers local signals are made, showing the least depth of water in the southern channel leading to Dunedin, from the first quarter flood until high water.

Extensive dredging operations are in progress between Port Chalmers and Dunedin; vessels drawing 16 ft. could reach the latter in 1883, and it is intended to dredge this channel to a depth of 18 ft., and a width of 100 yards.

CAPE SAUNDERS.—From Tairoa Head the coast runs S.S.-easterly for nearly 7 miles to Cape Saunders, marked by a beacon. This bold and remarkable headland is the south-eastern termination of the peninsula which forms the southern side of Port Chalmers.

LIGHTHOUSE.—Near Cape Saunders is a white wooden lighthouse, 28 ft. high, from which is shown seaward, between N.E. by E. and S.W. ½ S., a *revolving bright* light, attaining its greatest brilliancy once every minute, elevated about 210 ft., and visible 20 miles in clear weather.

From Cape Saunders the land trends away S.W. by S. in a curvilinear form towards *Quoin Point*, a rounded projection, 30 miles distant. There are some off-lying rocks and islets in this bight. Nearly 25 miles from Cape Saunders is *Taieri River*, navigable at its entrance for vessels drawing 6 to 9 ft.

Nugget Point, the southern extreme of Molyneux Bay, is 22 miles from Quoin Point, and 52 miles from Cape Saunders. It is a bold and projecting headland, the termination of a remarkable razor-backed mountain ridge, with three pointed rocky islets standing nearly half a mile off it.

The Lighthouse, on the extremity of Nugget Point, is a white stone tower, 31 ft. high, showing a *fixed bright* light, elevated 250 ft. above high water, and in clear weather should be seen from a distance of 23 miles.

Molyneux Bay.—Anchorage may be obtained in Molyneux Bay with off-shore winds, in 8 fathoms, about half a mile off the landing-place, and the same distance northward of Reef Point. This point is little more than 2 miles N.N.W. of Nugget Point, and has a reef of rocks extending three-quarters of a mile from it. *Coal* is found in a cliff on the North side of this bay, 7 miles from the mouth of Clutha River; on either side of this river are extensive clumps of wood.

CLUTHA RIVER (*Matau*) runs into Molyneux Bay, 4½ miles northward of Nugget Point. This is a considerable river, with deep water, but the narrow entrance is unfit for anything but very small vessels. Vessels of 80 tons can reach *Kaitangata*, about 8 miles above the mouth of the river; this place had a population of 394 in 1881, principally engaged in the *collieries*, to which a branch line of railway is constructed. The town of Balclutha, through which the railway passes, lies 15 miles up the river, and contained a population of 820 in 1881. Lignite is found in the neighbourhood,

From Nugget Point the coast trends S.W. by S. 14 miles to *Long Point;* thence S.W. by W. 11 miles to Chaslands Mistake, a black cleft cliff; and from the latter W.S.W. 14 miles to Slope Point. Southward from Nugget Point the coast becomes much broken, with occasional islets and reefs, which, in the absence of any regular anchorage for shipping on this coast, proved of great benefit as places of refuge to the boats engaged in the whale and seal fisheries.

Three miles southward of Nugget Point, and half a mile westward of False Islet connected with the main by a sandy neck, is *Catlin River*, navigable for small vessels. The township of *Newhaven* stands on the North bank of the river, half a mile inside the bar, where the channel is one-third of a cable wide.

Brothers Point, which has two rocky islets standing off it, is 5 miles westward of Chaslands Mistake, the coast forming a bight between them, in the centre of which is a boat harbour. *Waikawa River*, with 3 fathoms on its bar at low water, but a very narrow entrance, and strong freshes always running out, is 3 miles westward of Brothers Point; just to the eastward of its entrance is a white bluff. Small vessels have laid secured to the shore within the river, but exposed to considerable danger from the freshes, as well as the swell from southerly gales.

At 5 miles westward of Waikawa River is *Slope Point*, the southern extreme of Middle Island, a low treacherous point, off which the sea breaks for more than a mile.

Waipapapa Point, 7½ miles westward of Slope Point, is low and sandy, and is the N.E. extremity of Foveaux Strait; vessels should not approach within 3 miles of this part of the coast. From Otago to Waipapapa Point, a distance of about 110 miles, there are no dangers which extend more than a mile from the shore, and very few which do not show; neither can there be

said to be any remarkable features by which the seaman may be enabled to ascertain his exact position.

FOVEAUX STRAIT separates the Middle from South or Stewart Island, and lies in a W.N.W. and E.S.E. direction. The general width is 15 miles; and from Ruapuke Island, which lies in the eastern entrance, to the N.W. end of Stewart Island, a distance of 30 miles, it has a depth of from 15 to 28 fathoms over a sandy bottom.

Ruapuke Island, lying nearly in the centre of its eastern entrance, and surrounded as it is in almost every direction by islets, reefs, and tide ripplings, renders the approach from the eastward, unless in moderate weather, rather formidable to a stranger; there is, however, a clear passage on either side of it, 5 miles in width, and with not less than 12 fathoms water.

The northern shore of the strait, also, from Bluff Harbour to the western end of Tewaewae Bay, a distance of nearly 50 miles, is studded with islets and reefs, some of which extend 8 miles from the coast, and are not always visible; but, notwithstanding these dangers, Foveaux Strait has a clear navigating width, westward of Ruapuke Island, of never less than 10 miles.

The greatest difficulty the seaman has to contend with is the extremely boisterous weather which this part of New Zealand is constantly subject to. Gales from S.W. to N.W., but more frequently from the latter direction, blow with more or less violence, and without regard to seasons, throughout the whole year, frequently continuing without intermission for many days, and then lulling for a few hours only to return with renewed violence. There is also another difficulty to be encountered, which is a current always setting to the southward round the S.W. extreme of Middle Island.

Although the passage through Foveaux Strait from the eastward cannot be recommended for anything but steam vessels, it may be convenient for vessels from the westward bound for Otago, or the Canterbury settlements, or indeed from the Australian colonies to England, to make the passage through this strait; and from the westerly winds so constantly prevailing, it could be accomplished with great rapidity and in smooth water, and those ugly dangers, Trap Rocks, to the southward of Stewart Island, avoided.

SOLANDER ISLAND.—Ships entering from the *westward* should make this island, which is an excellent landmark, indeed a perfect finger post to the strait. It lies 22 miles southward of the South coast of Middle Island, and W. ½ S. 35 miles from the N.W. end of Stewart Island; it is nearly a mile in length, rises almost perpendicularly from the sea, and has a remarkable peaked summit 1,100 ft. high. An islet lies about a mile westward of it.

By arranging to pass Ruapuke Island, distant 68 miles from Solander Island, with daylight, vessels may take this passage without difficulty, and often with considerable advantage. By night the light on Centre Island will be found of great service.

The only port on the northern shore of Foveaux Strait eligible for ships of

burthen is Bluff Harbour (*Awarua*). On the southern or Stewart Island shore there are several ports which are always accessible and safe, and where vessels may wait for an opportunity of entering Bluff Harbour or New River on the North side.

RUAPUKE ISLAND, as before remarked, lies nearly in the centre of the eastern entrance of the strait. It is a low island, 4½ miles long in a North and South direction, and may be seen from a vessel's deck at a distance of 12 or 14 miles; the central part is 140 ft. high, and thickly covered with trees of stunted growth. The North point is a cliffy headland, with a hummock over it 220 ft. above the sea. The principal dangers lie off the eastern side of the island. The principal remnant of the native tribes of Middle Island live here under the care of a zealous missionary. There are but very few of their once large number scattered about in the small settlements on Foveaux Strait. *Green Island*, 190 ft. high, lies nearly a mile East of Observation Head, the eastern cliffy point of Ruapuke Island; between them is the *anchorage*, in 5½ fathoms, sand.

Seal Rocks, to the north-eastward of Green Island, are high out of water, but surrounded by reefs. A sandy rock connects Seal Rocks with Ruapuke Island, on which the sea occasionally breaks in heavy weather. *Toby Rock* is the most dangerous in the neighourhood; it is only awash at very low springs, and is not marked by kelp, as most of the dangers here are; it lies directly in a line with the North end of Green Island, and the high part of Seal Rocks, bearing N.E. by N. ¼ N., distant 1½ mile from the latter, and E. by N. ¾ N. 3¾ miles from the North head of Ruapuke Island. In 1882, a rocky shoal with 4 fathoms on it, named *Fairchild Shoal*, was discovered about 4 miles eastward of Ruapuke, with the East extreme of Green Island bearing S.W. by S., distant 4½ miles, Toby Rock, S.W. ¾ W. 2 miles, and Dog Island lighthouse W. ½ N., 11½ miles. The breakers reported 2 miles N.E. by N. ½ N. from Toby Rock are considered not to exist.

Breaksea Isles, two in number, surrounded by rocks, lie 1½ mile off the missionary station, and a mile South of Green Island.

Three rocky islets extend for half a mile off the South point of Ruapuke; they are known as the South Islets. *Kelly Rock*, which is not marked by kelp, and only breaks occasionally, lies nearly a mile S.S.E. of the southern extreme of the South Islets, and 1¼ mile E. ¾ S. from a remarkable black rock, the easternmost of the Hazelburgh Group.

Between the South and West points of Ruapuke Island is *Henrietta Bay* (on the S.E. corner of which is a considerable native village), and off these points, extending for a distance of 4 miles in a semicircular form, are the *Hazelburgh Group*, *Half-passage* and *Fife Rocks*, and *Bird Island*, together with several smaller patches inside and among them, which generally break. Vessels, unless coasters acquainted with the locality, should not go within the line of these islets and rocks. The north-western side of Ruapuke Island is

said to be perfectly free from dangers, with the exception of *Tupis Island*, which lies close off its West point, and another small islet lying nearly half a mile off the West point of Caroline Bay.

Caroline Bay, on the N.W. side of the island, is 1½ mile south-westward of the North head; it has a depth of 6 and 7 fathoms, with a large kelp patch in the centre, inside of which there is 3 fathoms.

It is to be observed, that although Ruapuke Island has so many dangers near it, the greater part of them are above water, Toby and Kelly Rocks and Fairchild Shoal are alone those that do not show; a strict look-out, however, is indispensable to ensure the safety of vessels navigating in its vicinity.

Directions.—Approaching the strait from the *eastward*, there are passages northward and southward of Ruapuke Island; either may be taken, according as the wind or circumstances may render desirable.

Northern Passage.—Passing along the South coast of Middle Island at a convenient distance of 5 or 6 miles, the remarkable and solitary hill called the *Bluff*, 900 ft. high, will be seen in clear weather 35 miles off. Steer for it when it bears W. ¼ N., allowing for the streams of tide. When the North end of Ruapuke Island bears South about 3 miles, Port William in Stewart Island will be distant 21 miles on a S.W. bearing, which leads to the northward and eastward of these islands; if not bound there, but through the strait, steer W.S.W., or for the high range of *Mount Anglem*, on the northern end of Stewart Island. This course will lead a vessel 2 miles to the southward of Dog Island, a low dangerous islet lying to the south-eastward of Bluff Harbour and Pahia Point, but now marked by a lighthouse.

South Passage.—Vessels from the eastward bound to any of the southern ports of Stewart Island would probably pass to the *southward* of Ruapuke Island, in which case they have only to give it a berth of about 4 miles, and when abreast and 2 miles off Hazelburgh Group, shape their course accordingly.

The *flood tide* sets through Foveaux Strait from West to East, and is the strongest between Bluff Harbour and Ruapuke Island. Between Ruapuke and Stewart Islands it sets to the south-eastward, running parallel with the shores of the latter. The ebb takes an exactly contrary direction.

It is high water, on full and change, in the western entrance of Foveaux Strait, that is, between the North point of Stewart Island and Pahia Point, at $12^h\ 15^m$, the flood stream commencing from half an hour to two hours after low water, according to the winds, it being earlier with those from the westward. The strength of the tide varies from a half to 2½ knots; in the narrow part of the strait, between Ruapuke and the Bluff, it is 3 knots.

The Bluff.—The remarkable hill or headland which rises immediately over the entrance of Bluff Harbour, forms a conspicuous and striking feature, contrasted with the great extent of level land in its vicinity, and it may be said to

be to the eastern entrance of the strait what Solander Island is to the western, a most useful and unmistakeable landmark. It stands at the S.E. extreme of a narrow and irregular-shaped promontory, which forms Bluff Harbour on its southern side, and the entrance to New River on its northern, these two ports being separated from each other by a low neck. From the summit, which is 855 ft. above the sea, a magnificent view may be obtained.

BLUFF HARBOUR (*Awarua*)—formerly a large whaling station—is at high water an extensive sheet of water stretching in two arms to the North and East, respectively 4 and 5 miles. It is now the first port of arrival and last of departure of the Melbourne mail-steamers. The anchorage is narrow and confined, and has 4 fathoms at low water. Above this, as well as the whole of the eastern portion, is flat and shallow, the greater part being uncovered at low water. The tides run very strong, during the springs as much as 7 knots; there is also a heavy tide rippling at the entrance, caused by the meeting of the harbour tide with that in the strait. The entrance and harbour are now buoyed.

Campbell Town stands at the foot of the Bluff on the South side of the harbour. In its early days, in 1857, it only consisted of five houses. It contained 351 inhabitants in 1881, and is the port for Invercargill, with which it is connected by a railway 17 miles long, which thence extends to Dunedin and Christchurch. It is also connected with Riverton by railway. Wool and grain are the chief exports. Preserved meats and timber are also important items. There is good wharf accommodation here connected with the railway.

Dog Island and Light.—The island is 2½ miles S.E. by E. from the entrance of Bluff Harbour; it is low, and three-quarters of a mile in extent. The sea breaks heavily for some distance off its northern and eastern sides. The lighthouse is of grey stone, 118 ft. high, from which is shown a *revolving bright* light, attaining its greatest brilliancy every *half minute*. It is elevated 150 ft above high water, and in clear weather should be seen at a distance of 18 miles.

A *sunken rock*, with 2 ft. on it at low water spring tides, is reported to lie a quarter of a mile from the West end of Dog Island, with the lighthouse bearing S.E. Another rock, which is awash at low water spring tides, is also reported to lie a quarter of a mile from the East end of the island, with the lighthouse bearing W. by S.

Vessels coming from the eastward, intending to enter by the North passage, should steer for the sandy point about 3 miles to the eastward of the harbour, until within half a mile of the shore, when a black buoy will be seen, which marks the N.E. end of the sand-spit. In moderate weather the pilot will board here, but should the pilot boat not be in sight, keep along the land about W. by N., leaving the buoys on the port hand, pass a cable off Tewaewae Rock (the eastern extremity of North head, which is about 10 ft. above water and bold close-to), and steer across for a large rock on the beach of the

western shore with a white patch on it, off which the pilot can board in any weather. Vessels drawing over 16 ft. water should not take this passage at or near low water. In 1880, the 3-fathoms knoll, nearly 4 cables S.E. ½ E. of Te Waewae Point, had shoaled and extended about 1½ cable southward, with 1¾ to 2 fathoms over it. A *chequered black* and *white buoy* has been placed on its N.W. extreme, and a *red buoy* on its S.E. extremity; both in 3 fathoms. When entering by the West channel these buoys must be left on the starboard hand, and when entering by the North channel on the port hand.

Vessels from the eastward taking the passage between Dog Island and the sands should give the island a berth of half a mile, and steer about West for Lookout Point until Starling Point bears North, then steer in to pass about 1½ cable off Starling Point, leaving the red buoys on the starboard hand. Large vessels intending to make any stay should anchor 1 mile above Starling Point, in 4 fathoms, within 1½ cable of the western shore.

Sandy Knoll, about 3 cables E.N.E. of Starling Point, and over which there was formerly a depth of 2 fathoms, was reported to have 3½ fathoms over it, in 1880.

On Bluff Hill there is a signal-station, with which vessels requiring pilots should communicate, or, when obscured, with the station on Starling Point. There is also a semaphore arm on the flagstaff on Starling Point, which is only used should a vessel be seen standing into danger. (See page 349.)

Lights.—A *fixed bright* light is shown from a small vessel moored in 13 ft. on the western side of the narrowest part of the entrance to the harbour, at 150 yards N.N.W. from the sunken Triangle Rocks, and 2 cables N. by W. from Burial Point. A *red* light is shown on the end of the jetty 3 cables West of the lightvessel. Vessels drawing over 12 ft. should not, at low water, pass southward of the line joining the lightvessel and the northern face of the jetty.

The following information is given by Mr. Thompson, 1867:—

Beacons.—On the North shore of Bluff Harbour are two white beacons, the northern one having a small triangular top. The beacons in line, bearing N. by E., lead towards Starling Point, off which the pilot boat should be seen. There are also two white beacons (the western one having a small triangular top), which lead through North passage, when in line, bearing W. by N., and close to the black buoy marking the N.E. end of the shoal on the South side of the passage.

Vessels of 14 ft. draft taking the South passage should haul up for Tewaewae Point when abreast of Starling Point, as the beacons in line, when to the northward of this point, lead into 2½ fathoms at low water. Vessels from the eastward should not bring Dog Island to bear to the northward of West, until Green Island bears S. by W. ½ W., in order to clear a dangerous break lying about 2 miles N.E. by N. ½ N. from Green Island.

There is no steam-tug at Bluff Harbour, but the services of coasting steam

vessels can often be obtained at moderate rates. There is a wharf in the harbour with a depth of 20 ft. alongside at low water.

The best time for a large steamer or a sailing vessel with a fair wind to enter is at high water or first quarter ebb; but sailing vessels during westerly winds should be at the heads at half flood.

Entering by either channel leave the *red buoys* on the starboard hand, and the *black* on the port.

Two dolphins have been placed on the Middle Spit, which lies North of the wharf on the West side of entrance to Bluff Harbour. One is on the East extremity of the spit in 12 ft. water, and is surmounted by a cross, painted red and white in horizontal bands. The other is on the middle of the spit, in 4 ft. water, and surmounted by a Y-shaped beacon, painted red and white in diagonal bands. These dolphins, when kept in line bearing about N.W. by W. $\frac{3}{4}$ W., lead through the deepest part of the channel, between Te Waewae Point and Burial Point, in not less than 24 ft. water.—1880.

NEW RIVER (*Orete*), 8 miles N.W. by W. from the Bluff, was accessible in moderate weather, at high water, for vessels drawing from 13 to 15 ft., but in 1882 it was stated to be only accessible for those drawing 8 to 10 ft. From the exposed and shifting nature of the bar, and channel within, as also the rapid tides, it is essential that a stranger should employ a pilot, who is established at this port.

The South or outer entrance point is well marked by Steep Head and Point Islet; the northern is low and sandy. A shifting bar runs across from Steep Head to an extensive bank of sand, extending from the North point, which covers at half tide; the bar is narrow, and the water soon deepens within to 4 and 5 fathoms, till *Bombay Rock*, 4 ft. above water, and $1\frac{1}{2}$ mile inside Steep Head, is reached. *Guiding Star Rock*, with 5 ft. on it, lies S.W. $\frac{1}{2}$ S. 2 cables from Bombay Rock and nearly in mid channel. A *white buoy* is moored abreast of it, which by vessels entering should be left on the starboard hand. Should the buoy be adrift the rock may be avoided by not bringing Bombay Rock to bear northward of N.E.

Invercargill is an important town, situated on New River 8 miles within its entrance. It contained a population of 4,596 inhabitants in 1881, and has railway communication with the surrounding districts.

Vessels bound for New River should approach to within a cable of Point Island, in 5 fathoms, then steer for a spiral-shaped *black* buoy outside the bar, in 6 fathoms, bearing from the North end of the island North half a mile. As the buoy is approached the leading *white* beacons will come on, bearing E. $\frac{3}{4}$ S., keep them in one, leaving the *black* buoy on the port hand, and the bar will be crossed in the deepest water; the breadth is about a cable, and inside in 4 fathoms is a spiral-shaped *white* buoy marking the South side

of the channel; keep between the white buoy on the starboard, and the black buoy on the North side.

From New River the coast trends in a long sandy beach to the N.W. 15 miles, when it curves round to Howell Point, and forms a shallow bay or bight just within it. In this bight, 1½ mile N.W. of that point, is the entrance of *Jacobs River*, the bar of which is nearly dry at low water, but vessels of 7 or 8 ft. draught enter at high water. There is also anchorage in *Howell Road*, about a mile off the river's mouth, where vessels may wait for the tide to enter, but they should not lie there in southerly or easterly winds.

Riverton, situated at the mouth of Jacobs River, is rapidly rising in importance on account of its proximity to the Orepuki gold fields, to which a railway is constructed 20 miles long. Large tracts of timbered country exist in the vicinity, coal exists, and ironstone is reported. It is also the port for a large export of grain from the western provinces. A railway connects it with Invercargill. The population in 1881 was 1,187.

From Howell Point the coast trends W. by S. ½ S. 10 miles, to a projecting rocky point (*Wakaputa*). Midway between at the western end of a sandy bay, is a native village, where a small mountain stream runs down, with a boat harbour at its mouth. This is remarkable as the last fixed native settlement on the coast. From Wakaputa, a rocky and indented coast trends N.W. 6 miles, to *Pahia Point*, the eastern extreme of Tewaewae Bay.

The northern shore of Foveaux Strait, from New River to Pahia Point, a distance of 25 miles, is fronted with numerous detached reefs and rocks, extending in some cases as far as 8 miles from the coast. Among them is a well-marked island, Centre Island, which, lying nearly at the outer or southern boundary, will be found a good guide for avoiding them. Caution and the chart must be used in passing through.

CENTRE ISLAND is moderately high, and about three-quarters of a mile in length; it lies 4 miles S.E. from Wakaputa point, and has a sunken rock a little more than one mile S.W. of its centre. Midway between it and Wakaputa Point are two extensive reefs awash, with a high rock on the East end of the southernmost one. *Fish Reef*, which lies 3 miles south-westward of Wakaputa Point, is an extensive patch; it breaks, and has 26 fathoms close outside it.

LIGHTHOUSE.—On the South extremity of Centre Island is a white wooden lighthouse, 20 ft. high, from which a *fixed* light is shown, elevated 265 ft., and visible about 22 miles in clear weather. The light is obscured to the N.W., between N. ⅛ W. and N.W. ¾ W.; from N.W. ¾ W. to W. ¾ N., it is *red* over the dangers off the coast; seaward, from W. ¾ N. round by South to E. by S., it is *bright;* and from E. by S. to N. ⅛ W., it is again *red* over Escape Reefs, and the dangers to the N.E. This light forms a very valuable guide for the navigation of the strait during the night.

Escape Reefs, the most southerly of the many dangers on this coast, lie 4

miles eastward of Centre Island. They are two detached reefs lying W. by N. and E. by S. of each other, and 1¾ mile apart; each has a solitary rock about 20 ft. above the sea. The eastern reef is 4 miles from Centre Island, on the same E. by S. bearing, and from the North point of Stewart Island it bears North 12 miles,—S. by W. ½ W. 7½ miles from Howell Point, and W. ¾ N. 18 miles from the Bluff. N.N.E. about a mile from each of the Escape Reefs, lie two other reefs awash.

Pig Island, a low round island, lies 2¼ miles S.W. by S. of Howell Point, with a sunken rock half a mile to the south-eastward of it, and two reefs awash between it and the shore. *Half-way Rocks* are two rocks standing well out of water, lying in a N.W. and S.E. direction, and nearly three-quarters of a mile apart; the south-easternmost bears N.W. by W. 4 miles from Steep Head, which is 3½ miles from the sandy beach to the North. A mile inshore of them are two other rocks awash.

Doubtful Rock.—This sunken rock, which only breaks in heavy weather, and whose exact position is doubtful, is placed on the chart bearing from Steep Head of New River W. ¼ N. 7¾ miles; from Howell Point S.S.E. 5½ miles; and from the southernmost of the Escape Reefs N.E. by E. ½ E. 4 miles, which cannot be far from its true position.

CAUTION.—There is deep water among and between many of the dangers just enumerated; they should therefore be approached with caution, and avoided in thick weather. Vessels are recommended not to pass within the 20-fathoms line on this part of the coast, and to keep 3 miles to the southward of the Escape Reefs and Centre Island. The coast between Wakaputa and Pahia Points should not be approached within 4 miles by passing vessels.

TEWAEWAE BAY, lying to the westward of Pahia Point, is a remarkable square-shaped bay, 7 miles in depth; Sand-hill Point, its western extreme, bears W. ½ S. 15 miles from Pahia Point, its eastern limit, and was so named from the coast terminating in a ridge of low sand-hills projecting from the high mountain land 5 to 6 miles northward. There are several detached rocks and reefs extending a mile off it, and at the distance of 2 miles from the shore 16 and 18 fathoms will be found; 2 miles northward of this point is *Mussel Beach* of the whalers, a small cove with a deserted whaling station, off which there is good anchorage in 5 fathoms, with all westerly winds, even as far round as S.W., but a heavy swell sets in with the wind in a more southerly quarter.

Mid-bay Reef is a treacherous reef lying in a direct line between the points of Tewaewae Bay, and 4 miles from Sand-hill Point, which, in moderate weather, only occasionally shows itself.

Between Sand-hill Point and Preservation Inlet, 28 miles to the westward, there is no point of interest to the sailor.

STEWART OR SOUTH ISLAND.

Stewart or South Island was discovered, but not examined, by Captain Cook, in his first voyage, 1770; he considered it to be part of Middle Island. Its coasts were explored by the ship *Pegasus*, Captain J. Chase, in 1809. It was then found to be uninhabited, abounding in wood fit for ship-building and other purposes. The harbours of Southern Port, or Port Pegasus, were sketched with tolerable accuracy by W. Stewart, first officer of the *Pegasus*, afterwards commanding the ship *James Hay*. From him the name of the island is derived. The name of New Leinster was subsequently given, but has not come into use.

In connection with the extensive pastoral country adjoining it on Middle Island and which is so deficient in harbours, it bids fair to become of some importance, as it possesses, on its eastern and S.E. sides, several excellent ports, affording every facility for shipping. Many of the European whalers and sealers, with numerous half-caste descendants, still reside there, forming in themselves an exceedingly interesting community, indeed they are now by far the most numerous occupants of the soil. The population in 1881 amounted to 295.

The island is of an irregular triangular shape; its western or longest side runs in a North and South direction 39 miles, and its greatest breadth is little more than 20 miles. It is for the most part mountainous and thickly wooded with timber adapted to ship-building and other purposes. An irregular ridge of mountains, of which *Mount Anglem*, 3,200 ft. above the sea, is the highest, runs in an East and West direction along the North coast of the island. Nearly in the centre is a remarkable dome-shaped mountain, 2,110 ft. high. The South end of the island is also extremely hilly, though the land does not attain such an elevation as in the North. The coasts are studded in many parts with numerous islets and rocks.

Saddle Point, the N.E. extremity, and remarkable in feature and position, is rather a low projecting point, the end of a spur from Mount Anglem, lying 3 miles S.W. of it. From the Bluff on the opposite shore it bears S.W. ½ W. 15 miles, and forms the breaking point of the westerly swell in Foveaux Strait. After rounding this point, however hard it may be blowing from the westward, shelter, with comparatively smooth water, is immediately met with. From Saddle Point the coast trends S.E. ½ E. 8½ miles to the entrance of Port William; midway between them, at the northern end of a sandy bay, is a small stream known as Murray River.

Off *Murray River* is a good roadstead in all winds westward of N.W.; the anchorage is little more than half a mile off the shore in 9 fathoms. The river itself is a mere stream; its entrance, however, forms a good boat harbour, and on the banks is the principal half-caste settlement in the island. In moderate

weather anchorage may be had, if necessary, along the whole line of coast between the N.E. or Saddle Point and Port William, a mile from the shore. *Gull Rock* is a white rock close to the shore, 3½ miles N.W. of the West head of Port William, and forms in appearance the S.E. head of Murray River and Bay.

Newton Rock, a dangerous sunken rock, lies N.W. ¾ W. 2⅛ miles from the West head of Port William. It is a long mile from the nearest land, has 6 ft. on it at low water, and is not marked by either break or tide-ripple; it is therefore an unusual feature in the navigation of these coasts, and lying directly in the track of vessels running between Saddle Point and Port William, must be carefully avoided.

PORT WILLIAM, 5 miles S.E. from Murray River, is an excellent little port, and, although apparently open for a large vessel to anchor in, it is well sheltered from easterly winds and the swell, by the coast about the Bluff Harbour, Ruapuke Island, and the groups of islands and rocks between it and Paterson Inlet. The port may be known by the bearing of the Bluff, which is N.N.E., 16 miles from its West head; its entrance bears also W.S.W. 6 miles from the most northern of the group of islands immediately off the port. Approaching from the northward, a remarkable white sand patch will be observed 3 miles westward of the entrance, or just southward of Gull Rock. *Pender Rock*, which is the only danger in running into Port William, is a 10-ft. rock, lying 3 cables E.S.E. from the West head, well marked by a long kelp patch, which also serves to break the swell with easterly winds. Wood and water may be had in abundance from a bay and river at the southern head of the port, where there is also a native village.

"Port William abounds with fish. One settler only is living there now with his family, principally engaged in oyster dredging, finding a market for them at the Bluff."—H.M.S. *Dido*, 1872.

Fish Rock is a little more than 1 mile eastward of the East head of Port William, midway between it and the group of islands which lie off; it is 30 feet high, with deep water close-to, and tide ripplings generally round it.

Horse-shoe and *Half-moon Bays* are two small bays immediately southward of Port William; they were much frequented by whalers, and afford good anchorage with off-shore winds in 5 and 6 fathoms. Half-moon Bay, the southernmost, has a rock above water nearly in the centre, with a patch of 9 ft. a short distance within it. There are a few settlers on its shore. Nearly 3 cables N.E. by E. from the southern point of Half-moon Bay (Akers Point) is *Barclay Rock*, awash at low water.

PATERSON INLET.—The entrance to this spacious port lies 4 miles to the south-eastward of Port William, between Akers and Anglem Points, which lie nearly N.W. and S.E. 2 miles apart. This inlet is a deep indentation, running in a westerly direction into the centre of the island for a distance of 10 miles, and with a width in some parts of more than 3 miles; the westerly

gales rush down it with great fury, and ships should seek shelter in one of its numerous coves rather than anchor in its open waters.

Vessels entering Paterson Inlet from the northward should pass inside the group of islands off Port William, and on either side of Fish Rock. Approaching from the southward, they may either take the passage between Anglem Point and Bench Island, the southernmost of the group of islands and rocks to the North of it, or between Bench Island and Fancy Group. To the northward of Bench Island, between it and Fancy Group, there is a clear channel of a mile in width, with a depth of from 20 to 24 fathoms. It will be needless to describe the numerous bays and coves which indent the shores of the inlet.

Port Adventure is 10 miles to the southward of Paterson Inlet, the coast line between being a succession of bold rocky headlands, with occasional sandy beaches, but without shelter even for boats.

East Head, a projecting headland, and the eastern point of Stewart Island, is 2½ miles to the northward of Port Adventure.

The port is small, and open to the eastward, but affords good shelter in all westerly winds. Entrance Island renders the passage in, narrow for large vessels to work through. *Stirling Head*, the northern entrance point, is steep and cliffy, with a small islet (*Weka*) lying close off it, The southern entrance point, Shelter Point, has a detached rock awash lying nearly a quarter of a mile distant; and *Breaksea Islands* extend 1½ mile southward of it.

The best passage in is between Stirling Head and Entrance Island; this passage is scarcely 4 cables in width, but has from 14 to 20 fathoms, except a patch of 18 ft., which lies W. by S. ½ S. 2 cables from the North point of the island. The passage southward of Entrance Island has the same width, but has a rock in the centre of it, with 20 ft., which is marked by kelp; there is deep water on either side of this rock. When inside the heads there is a clear working width of three-quarters of a mile, with a depth of from 9 to 13 fathoms; on the South side there are several rocky patches, with no more than 9 ft. on them; they extend a quarter of a mile from the shore, are marked by kelp, and have deep water between them. At 1½ mile within the entrance the harbour terminates in three coves, in the southernmost of which, Oyster Cove, small vessels might lie in safety with all winds.

Weka, *Wreck*, and *Bruce Reefs*, lying off the entrance of Port Adventure, are the principal dangers on this part of the coast. *Weka Reef*, the northernmost, is a quarter of a mile in extent, detached, and although covered, always breaks; it bears from Weka Islet N.E. by E. ¾ E., distant 1¼ mile, and from the North end of Entrance Island N.E. ½ N., nearly 1½ mile. *Wreck Reef* is also detached, and has a rock on it just above water; in bad weather it breaks very heavily. The position of this reef is E. by S. 2 miles from the East end of Entrance Island, and N.E. ½ N. 3 miles from the outer Breaksea Islet. *Bruce Reef*, a serious danger, 3 to 6 ft. high, is 5 miles E. ½ S. from Shelter

Point; it is described as consisting of two rocks close together, on which the sea breaks heavily.

Lords River, 3½ miles to the south-westward of Shelter Point, may be known by a cluster of rocky islands lying off its eastern head, the coast between which and the Breaksea Islands forms as a bight when seen from seaward. This little harbour is a narrow arm of the sea, running in a W. by N. direction, and is a snug anchorage for a steamer or small sailing vessel.

PORT PEGASUS may be recognized by *Fraser Peaks*, three remarkably bare granite cones from 1,000 to 1,430 ft. high, which are over the South arm about a mile from the West side of Stewart Island. The main entrance of this noble port is 17 miles S.W. by W. from Lords River, the coast between being very rocky.

The port is 7 miles in extent N.E. and S.W., lying parallel with the coast, which it gives a broken appearance to, from the many passages in. Three islands lie in the entrance, which form the same number of ship channels between them. The main or broad passage is a long half mile wide in its narrowest part, and lies between Pearl and Anchorage Islands, the N.E. and centre islands, and carries a depth of from 20 to 24 fathoms, with no dangers. The southern or narrow passage is between Noble Island, the south-easternmost, and the main land, and in its narrowest part is not more than 2 cables in width, with a depth of 15 fathoms. The northern or Whale Passage is still narrower, being little more than a cable across, with a depth of only 5 fathoms. It lies between the northern shore and Pearl Island; between Noble and Anchorage Islands there is only a boat passage.

Either of the three ship channels may be taken according to circumstances, though Broad Passage alone is recommended for a vessel of large size to work through; it trends N.W. by N., and the Narrow and Whale Passages W.N.W. The port is divided into two distinct portions, the North and South arms, which are connected by a narrow strait, *Acheron Anchorage*. Broad and Whale Passages lead direct to the North arm, and Narrow Passage to the South.

Port Pegasus abounds in excellent timber fit for ship-building or other purposes, and no difficulty will be found in procuring fresh water from the streams in any of the coves. Wild fowl are numerous in some parts.

Wilson Bay is a deep indentation, trending North and South, 4 miles south-westward from Port Pegasus and 2 miles N.E. of Cook's South Cape of New Zealand; its shores are skirted with rocks, and being exposed, with a depth of from 14 to 20 fathoms, it can only be considered a retreat in case of necessity; small vessels may, however, obtain shelter in Burial Cove, on its western side, half a mile from the head of the bay.

The southern end of Stewart Island terminates in a block of land 4 miles in width, the extreme of which, the S.W. cape, called by the natives the tail of the island, is 3 miles to the westward of Cook's South Cape, and has sunken

rocks extending nearly half a mile off it; the neighbouring land is high and bold, with a steep and rugged shore.

The TRAPS are two dangerous and well-named reefs lying to the south-eastward of the South end of Stewart Island. The North Trap Reef covers a space of 2¼ miles, and has two rocks near either extremity, 3 to 4 ft. high, and resembling in size and shape a boat turned bottom up; the centre of the reef bears from Cook's South Cape E. by S., 15¼ miles, and is distant 11 miles from the nearest land (between Wilson Bay and Port Pegasus), the depth of water between being 60 fathoms; 2 miles to the westward of this reef there is 23 fathoms. They should be given a wide berth.

The *South Trap Reef* does not cover so much ground as the North; it is nearly 2 miles in extent, with portions from 4 to 6 ft. above high water, and heavy breakers about it; its centre bears from Cook's South Cape S.E. by E. distant 20 miles. These two reefs bear from each other N. ½ W. and S. ½ E., distant little more than 9 miles H.M.S. *Acheron* had 48 fathoms water between them, but since then (in 1862), another reef has been reported, the *Boomerang Breaker*, which lies about N.W. by N., 3½ miles from the South Trap.

The South-western Side of Stewart Island is fronted by an irregular group of rocky islands; the most outlying of these, *Wedge Island*, is a mile long, and fully 6 miles from the land. The natives frequent them during summer for mutton birds.

Port Easy, a confined anchorage in 5 fathoms for small vessels, is occasionally visited by sealing craft, and lies 9 miles to the northward of S.W. cape. Between Port Easy and Mason Bay, a distance of 15 miles, there is no shelter for vessels.

Mason Bay is a peculiar low and sandy feature on the wild and inhospitable West coast of this island; it has a sandy beach 5 miles in length, with a wooded flat lying at the base of the mountain ranges. There is anchorage in its southern part in from 3 to 4 fathoms, protected from West and N.W. winds by two jutting, red, cliffy-faced islands (Ernest Isles). A heavy sea rolls into the bay from the northward, and there are some dangers in its entrance, as shown on the chart.

Codfish Island lies 9 miles N.N.W. of Ernest Islands, and 4½ miles S.S.W. from *Rugged* or *Raggedy Isles*, which latter extend off the N.W. extreme of Stewart Island. It is 3 miles in length in a N.W. and S.E. direction, and 2 miles across, moderately high, level-topped, and has a small stony eminence rising near its centre. There is a confined anchorage in Sealers' Bay on its N.E. side, well sheltered from all westerly winds, in 6 to 8 fathoms.

Tides.—The flood tide coming from the southward strikes the South end of Stewart Island, and divides, one part running to the northward along its western side, and then to the eastward through Foveaux Strait; the other to to the N.E., along the S.E. side of the island, as far as Port Adventure, where

they meet again, and flow to the eastward. The ebb takes exactly a contrary direction, splitting near Port Adventure. It runs to the N.W. through the strait, and down the West side of the island, and to the S.W. along the S.E. side as far as the S.W. cape.

It is high water, on full and change days, at Ports Pegasus and Adventure, at $11^h\ 50^m$ and $12^h\ 20^m$ respectively; at Port William and Paterson Inlet at $12^h\ 45^m$ and $1^h\ 10^m$; and Mason's Bay at $11^h\ 10^m$. Springs rise 8 ft., neaps 6 feet.

The SNARES are a bold and moderately high group of islands, destitute of vegetation, and covered by myriads of the pintado or cape pigeon; they lie 62 miles S.S.W. of the S.W. end of Stewart Island, and extend $4\frac{1}{2}$ miles in a N.E. by E. and S.W. by W. direction; they are an excellent landmark from the westward, and are recommended to be made as a point of departure in passing South of Stewart Island, whereas the name they bear would deter vessels from approaching them.

The N.E., or largest island, is little more than 1 mile in length by half a mile in breadth, rising on the South side perpendicularly to the height of 470 ft.; the N.E. side is less precipitous, where the land rises gradually from the sea. The island is composed of rough, coarse granite, covered with a chocolate-coloured vegetable mould of variable thickness, in which are numerous bird burrows, every available piece of soil being made use of by them. This island is tolerably well covered with vegetation, consisting chiefly of a heavy scrub, varying in height from 10 to 15 ft., and coarse, high, broad-bladed grass, growing in tufts, together with a finer wiry kind of grass, on stems 2 to 3 ft. high.

About the centre of the N.E. side of this island there is a good boat harbour, the shores of which are rocky; the entrance is about 30 yards wide, with a depth of 8 fathoms in the centre, decreasing gradually to 3 fathoms near the head of the boat harbour, on the North side of which is the landing-place. This boat harbour is open to the N.E., but safe in all weathers for boats. About three-quarters of a cable in a south-easterly direction from the entrance lies a sunken rock.

The Snares are surrounded with deep water, and there is no anchorage except close under, and to the eastward of North-east Island, where a steam vessel may ride with a stream anchor in 40 fathoms during moderate weather. Fresh water is plentiful on North-east Island, but strongly impregnated with peat and guano. Eastward of North-east Island lies a smaller island, of much the same character; there is a boat passage between them.

The western portion of the group consists of four islets, separated from the large island by a channel of 2 miles in width. H.M.S. *Chatham*, Lieut. Broughton, in 1790, ran through this channel, passing a breaking reef of rocks lying in nearly a direct line between the larger island and the western

group, narrowing the channel between the reef and the former to about 1½ mile.

The largest of the four western islets is about a quarter of a mile long, and the smallest about half that size. These islets lie in a North and South direction, and extend over a mile, forming a rugged ridge of almost inaccessible rocks, the highest of which are 290 ft. high. No vegetation or water appears on any of the western islets, and landing can only be effected in the finest weather.

The S.W. island is in lat. 48° 6′ 43″ S., long. 166° 28′ 40″ E.; the tides about the group are inconsiderable.

WEST COAST of Middle Island.—Along the whole extent of the West coast of Middle Island, a distance of 500 miles, are those singular and truly remarkable sounds or inlets which penetrate its south-western shores between the parallels of 44° 34′ and 46° 12′ S. latitude.

The precipitous and ironbound coast which forms the sea wall, as it were, in which these extraordinary inlets may be almost likened to so many breaches, runs in a N.N.E. and S.S.W. direction; and the whole, thirteen in number, are included within a space of little more than 100 miles. These sounds seem to be analogous to the Norwegian fiords, to the inlets which penetrate the lofty coasts of British Columbia, or the glacier-closed sounds of West Greenland. In no other part of the world are such majestic natural features met with.

The country is exceedingly mountainous through all the southern part of this western coast of Middle Island. "A prospect more rude and craggy is rarely to be met with; for inland appears nothing but the summits of mountains of a stupendous height, and consisting of rocks that are totally barren and naked, except where they are covered with snow."—*Capt. Cook.* But the land bordering on the sea coast, and all the islands, are thickly clothed with wood, almost down to the water's edge. The trees are of various kinds (among them the useful red pine), and many of them are from 6 to 8 and 10 ft. in girth, and from 60 to 80 or 100 ft. in height.

In approaching from seaward there is so much sameness in the appearance of the land, that unless a vessel knows her position accurately, it is not easy at a distance to distinguish the entrance of one sound from another, and the smaller inlets at a distance of 4 or 5 miles have more the appearance of ravines between the high and rugged mountains than the entrances of harbours. In moderately clear weather the coast can be made with confidence, and as the entrances are generally equidistant from each other (about 8 miles), and all running in an easterly direction, there would be little danger to be apprehended from a lee shore; it must be remarked, however, that a fresh or even strong westerly wind in the offing frequently dies away within a mile of the coast, leaving a vessel at the mercy of a calm or swell, when recourse must be had to towing. Moreover, in consequence of the enormous quantity of fresh

water which falls in cascades from the steep mountain ridges, there is always an outset, particularly from the smaller sounds, and frequently a draught of wind down their narrow arms, so that, unless with a fresh, fair gale, which blows right home, and up the sounds, sailing vessels will generally find it a difficult and tedious operation to fetch inside their entrances.

The most remarkable feature, common to the whole, is their great depth of water. Soundings can rarely be obtained under 80 or 100 fathoms, and frequently at much greater depths; and the shores, within a few yards, are quite steep-to. Vessels may frequently with advantage warp up by laying out lines to the shore; and when a cove is reached where an anchor may be dropped, it will generally be necessary to secure to the trees also, to prevent being drifted off the steep bank by a flaw of wind. These flaws or squalls frequently blow with great violence off the high land, or down the gulleys, during heavy gales outside.

At the entrance of several of the sounds a narrow bar or belt of soundings from 30 to 50 fathoms will be found to extend across.

Daylight is the best time for leaving these anchorages, when a land wind prevails for a few hours; indeed, unless the wind is blowing direct in, a vessel will seldom have any difficulty in getting to sea. Near the coast a constant current of nearly a mile an hour sets to the S.W.

The prevailing winds on this coast are from N.W. to S.W., the former frequently bring rain and thick weather, and as the shore is approached, generally veer to the northward; S.W. winds are fine and clear; rain is of very frequent occurrence, and often lasts for several days together without intermission.

There are no inhabitants on this part of the island. The ground, being covered with wood, produces myriads of flies of a very poisonous description. The bite of a mosquito is not to be compared to it for severity and effect; it is a small black fly, with a deep blue tinge.

Excellent fish of several kinds are abundant, and may be caught with hook and line close to the rocks at the entrances.

PRESERVATION INLET, the southern of this series of remarkable sounds, lies at the S.W. extreme of Middle Island, 80 miles from Port William, the nearest port of Stewart Island, and the same distance from Bluff Harbour.

Its entrance lies between Puysegur Point and Gulches Head, which are 4¼ miles distant from each other in a N.N.W. and S.S.E. direction. The southern point, *Puysegur*, is a low sloping projection. *Gulches Head* (the dividing point between Preservation and Chalky Inlets) is extremely rugged and cliffy, with rocks above water extending 2 cables off, as also a sunken rock, detached and generally breaking, one-third of a mile South of it. *Coal Island*, 850 ft. high, 2½ miles long North and South, and 1½ mile wide, lies between these

two points, and divides the entrance, the northern or main entrance being 1½ mile in width; the southern is merely a boat channel.

LIGHTHOUSE.—On Puysegur Point is a white wooden lighthouse, 40 ft. high, from which is shown a *flashing* light, with a flash every 10 seconds, elevated 180 ft., and visible 19 miles in clear weather.

Balleny Reef lies off the main entrance, its nearest point bearing S.S.W., three-quarters of a mile distant from Gulches Head. The reef is partly awash. *Table Rock*, a flat rock, 20 ft. high, lies W.S.W. 2¼ miles from Gulches Head, and N.W. by W. ½ W. 1 mile from the outer rock of Balleny Reef. There is deep water close to this rock, and a passage between it and the latter reef.

Coming from the southward or eastward, Preservation Inlet will be readily known, as being the first opening seen. From the westward the high white cliffs of Chalky Island, at the entrance of the inlet of that name, and 2 miles westward of Gulches Head, are an excellent guide; also *Treble Mount*, which reaches an elevation of 3,380 ft., and makes from the westward with two peaked summits. This mountain is remarkable; it bears from the main entrance N.N.E., distant 7 miles.

Entering Preservation Inlet with a N.W. wind, it must be remembered that, as the port is approached, this wind always draws to the N.N.W. Balleny Reef should therefore be hugged within less than half a mile, and Gulches Head be kept pretty close on board; and if Coal Island cannot be weathered, a vessel should not stand far over towards it, but keep to the North shore until as high up as Price's Beach, which is the sandy beach a mile above Gulches Head; and off which, in *Welcome Road*, a vessel may anchor in N.W. winds, in 8 fathoms, 3 cables from the beach; this, however, is only a stopping place.

Between Gulches Head and Cavern Head, a rugged, broken point, a bay runs to the northward for 1¼ mile; 2 cables within the line of these two heads lies a *dangerous reef*, which does not always break; there is 17 fathoms close to this reef, and entering with a leading wind a vessel will be well clear of it so long as she does not stand inside the line between Gulches and Cavern Heads. A sunken rock lies 1½ cable W.S.W. from Cavern Head.

Cuttle Cove, the first sheltered anchorage, lies a mile to the northward of Cavern Head. After rounding this head the passage up lies between the western shore and Cording Islets; and in the narrowest part is scarcely 4 cables in width. The cove will be known by being the third bight above Cavern Head, and by a small islet (Single Tree Islet) lying off it. The anchorage is between this islet and the main land, in from 10 to 15 fathoms, mud, and is snug and well sheltered.

Above this there are several small anchorages, but as they are not generally required, and will only be entered by vessels on special occasions, they need not be described.

The South Entrance of Preservation Inlet lies between the South end of Coal Island and Puysegur Point, and may be used with advantage by small vessels arriving off Preservation Inlet, with a strong N.W. wind. The entrance is narrow, and a sunken reef lying in the centre leaves the passage, which is between the reef and the point of Coal Island, not more than 2 cables in width. A vessel intending to take this channel must get well to windward before bearing up for it, and then hug the point of Coal Island as close as possible, and if not able to lay through, should drop her anchor as soon as under the lee of it, in 8 or 9 fathoms, and immediately send out a hawser to the rocks on the island shore. A mile within the entrance a bar of sand extends across, with only 6 ft. at low water.

When anchored in one of the snug coves of Preservation Inlet, very little idea can be formed of the weather outside, and a boat should always be sent to Craven Head to observe it before putting to sea.

It is high water, on full and change, in Cuttle Cove, at $11^h\ 20^m$; the range of tide is from 4 to 8 feet.

CHALKY or Dark Cloud Inlet lies immediately to the N.W. of Preservation Inlet, being only separated from it, as before remarked, by a high peninsula, of which Gulches Head is the southern extreme. *Cape Providence*, its western entrance point, 300 ft. high, is surrounded by reefs and sunken rocks, which extend from it 1 mile to the southward. Its entrance is well denoted from seaward by the white cliffs of Chalky Island, which lies in the centre of it, and also by the lofty Mount Treble, rising over its eastern side. The main arm of this inlet runs in a N. by E. direction $8\frac{1}{2}$ miles from the S.E. point of Chalky Island, with a breadth of nearly $1\frac{1}{2}$ mile, when it divides; Edwardsons Sound continuing the northerly trend for 6 miles further, and Cunaris Sound taking an E.N.E. direction for almost the same distance, the eastern head of the latter meeting within little more than a mile of Long Sound in Preservation Inlet.

The principal anchorages are South Port and North Port, the former on the eastern side, 4 miles above Gulches Head, and the latter on the western, 6 miles within Cape Providence. Chalky Island and Passage Islands, immediately to the northward, lie in the middle of the entrance, leaving a wide ship channel on either side of them.

The Eastern Passage, between Gulches Head and Chalky Island, is the most convenient for vessels from the southward. Balleny Reef and Table Rock, which have been already described, lie across the entrance of it, and vessels may enter either by the passage between Gulches Head and Balleny Reef, or between Chalky Island and Table Rock. This latter passage is by far the best, and is entirely free from dangers.

The Western Passage, between Cape Providence and Chalky Island, is the best for vessels entering from the N.W., as with a wind not to the northward of N.W. they would lay through and fetch South Port. In taking this passage,

the reefs awash and sunken off Cape Providence, the western entrance point, are the only dangers to be avoided.

South Port is a deep bight, penetrating the eastern shore of the inlet for nearly 2 miles in a S.E. by S. direction, and with a breadth, when inside, of nearly half a mile. The entrance, which is 4 miles above Gulches Head, is rendered very narrow by the islets and rocks which lie in it; the narrowest part is less than a cable in width, so that vessels can only enter with a leading wind, or tow in during a calm.

North Port, on the western side of Chalky Inlet, 6 miles above Cape Providence, lies between Great Island and the mainland, which are connected by a bank with only 1 fathom water from about the centre of the island; the South entrance to this port becomes in consequence a blind one. A pinnacle rock, with 5 ft. on it at low water, lies a cable outside the outer rock, off the South point of Great Island. North Port is easy of access with a leading wind, but the entrance lying in a westerly direction is opposed to the prevailing winds, and is therefore not so convenient a harbour for sailing vessels as South Port, but for a steamer it is certainly preferable.

WEST CAPE.—From Cape Providence to South Point, the South entrance head of Dusky Sound, is 13 miles in a N. by W. ½ W. direction. West Cape, a well-defined projecting point of moderate height, lies midway between, and projects about half a mile from the general trend. There are no dangers extending any distance from this coast.

DUSKY SOUND, or Bay, as it was named by Cook when he first discovered the opening, lies between Five Fingers Point and South Point; the width between being 4 miles. In approaching from the southward, Chalky Island will be found a good guide to the entrance, as will also West Cape.

From the northward, *Five Fingers Point* cannot fail to be recognized; it is the S.W. extreme of Resolution Island, which separates Dusky from Breaksea Sound. Several high pointed rocks stand off its extreme; these, when viewed from certain situations, give it the appearance of the fingers of a man's hand, from which circumstance it received the name from Cook; as that navigator also observes, "the land about the point is still more remarkable by the little similarity it bears to that adjacent to it, being the extreme of a narrow peninsula, lying N.N.E. and S.S.W. for 7 miles, of a moderate and equal height, and covered with wood."

Dusky Sound runs in an E.N.E. direction 22 miles, and is studded with numerous islands and rocks, but has few dangers that are not visible.

Anchor Island, 3½ miles long, rising to an elevation of 1,360 ft., lies immediately within the entrance, in the direction of the sound; and is surrounded by a labyrinth of smaller islets. A small harbour on its North side, about the centre of the island, affords secure anchorage, being sheltered from the northward by Petrel Islands, which lie immediately off its entrance. Vessels

entering the sound northward of Anchor Island with a strong North wind, and unable to work up for Facile Harbour, might find it convenient to anchor here.

Entering by the southern passage, a vessel may pass on either side of Entry Island, a small island a quarter of a mile S.E. of the large Petrel Island; if to the northward, the S.W. end of large Petrel Island should be kept close on board, to avoid a sunken rock with 13 ft. at low water, which lies S. by W. one cable from that point; if to the southward of Entry Island, that island must also be passed close, to enable a vessel with a northerly wind to weather a rock above water, lying nearly in the middle of the harbour entrance. Having passed it, steer south-westerly for the entrance of the harbour, distant little more than a quarter of a mile, and anchor in 16 fathoms, a cable from the shore. The passage in, to the northward of Petrel Island, is the widest, and with a North wind, the best. These islands are bold-to; and passing between the large Petrel and the East point of the harbour, take up a berth as before directed.

The principal anchorages in Dusky Sound are, Pickersgill Harbour and Cascade Cove on the South side, Facile Harbour and Duck Cove on the North. *Pickersgill Harbour* is 5½ miles above the South entrance point, and immediately abreast the West end of Indian Island, which is half a mile from the South shore. Crayfish Island lies across the entrance of the harbour. The narrow passage in, by which Cook entered, is that westward of this island, but the best channel is to the eastward, avoiding a half-tide rock which lies a short distance from the shore of the main land; by keeping the island close on board, this rock will be cleared, and when within, anchorage may be had in 15 fathoms, a cable from the shore. *Cascade Cove* is three-quarters of a mile above Pickersgill Harbour, and has good anchorage in 12 to 15 fathoms.

Facile Harbour, on the North side of Dusky Sound, is a deep-water anchorage, formed between Parrot and Pigeon Islands, and the eastern shore of the main, its entrance bearing N.E. by N. 4½ miles from Five Fingers Point. Cook recommends this harbour for vessels bound to the southward, and undoubtedly they would get easier to sea, with a northerly or N.W. wind, than from the ports on the southern side. A sunken ledge, with 9 ft. over it, lies in the centre of the entrance to the cove on the N.E. side of the harbour.

Duck Cove is easy of access, and is a convenient anchorage for vessels under any circumstance. It lies on the North side of the sound, 3¼ miles N.E. ¼ N. from the North end of Indian Island. Vessels bound for Duck Cove, and entering Dusky Sound by the southern passage, should keep the South shore on board until reaching Indian Island, and after passing a convenient distance along its North side, steer N.E. for the entrance of the cove, where soundings in 30 fathoms will be found, which decrease gradually to 15 and 10 fathoms at its head. A sunken 6-ft. rock lies about 3 cables W. by N. from Porpoise Point, the eastern point of the cove.

If entering from the northward, after passing Anchor Island, steer through

the channel between its eastern end and the main land; there are no dangers in it but what are visible.

Returning now to Five Fingers Point, and proceeding northwards, the outer coast of Resolution Island trends N.N.E. 10 miles to Breaksea Sound, and is somewhat remarkable from being lower than the neighbouring land. Some dangers lie off the coast northward of Five Fingers Point, and the land should not be approached within 1½ mile hereabout.

BREAKSEA SOUND is noticed by Cook, who did not explore it to its head, as the northern entrance of Dusky Bay, in consequence of his having passed to sea through it by the arm which connects the two. *Breaksea Island*, which is about 3 miles in circumference, and considerably lower than the land of the main, lies N.N.E. 12 miles from Five Fingers Point. The entrance of the sound being rather narrow, and surrounded by very high land on either side, is not easily distinguished until within a few miles.

There is a passage in on either side of Breaksea Island: that to the northward is the best, being a mile in width, and entirely free from dangers. If the South channel is taken a vessel should pass to the southward of three small islands South of Breaksea Island, between them and Gilbert Islands; this passage is not more than half a mile in width. There is a passage between Breaksea Island and the three small islands, but it is not recommended, as a long reef extends from the South side of the former island, rendering it very narrow. The best anchorage in Breaksea Sound is on the South side, 2½ miles above Entry Island, inside the islands, which extend for 3 miles along that shore.

Daggs Sound.—From Breaksea Island to the entrance of Daggs Sound is 12 miles to N. by E. From the South entrance point of the sound a cluster of rocks will be seen extending a quarter of a mile off; and 1 mile North of the North entrance head is a remarkable rocky peninsula point. The general trend of the sound is E. by S. for nearly 5 miles, when it branches into two arms, one taking a N. by W. direction for 2 miles, and the other running south-easterly the same distance. At 2¼ miles within the North entrance point is a 4-fathoms bank, nearly in mid-channel. Anchorage may be obtained at the head of the North arm, in from 12 to 18 fathoms, 2 cables from a stony beach, with several streams of fresh water running through it.

Doubtful Inlet.—The entrance of this extensive inlet lies 7 miles N. by E. from Daggs Sound. The depth of water at the distance of a mile from the shore was found to be 188 fathoms. Its entrance, which is contracted to 1¼ mile in width by the islets and rocks off the North and South points, will be clearly distinguished from a long distance; All Round Peak, and Mount Groznoz, on its northern side, from 4,000 to 5,000 ft. elevation, are very striking.

The general trend of Doubtful Inlet is E. by S. ½ S. for 17 miles, with three arms on its South side extending from 3 to 4 miles in a southerly direction.

The general depth of water in Doubtful Inlet is very great. In the main

arm soundings were rarely obtained under 120 fathoms, and in the smaller branches from 40 to 70 fathoms. The anchorages are few, and not easily found by sailing vessels; with the exception of the small craft anchorage, between Shelter Islands, that in Blanket Bay, and at the heads of the First and Crooked Arms, there is no place where a vessel could find shelter in a moderate depth of water.

Thompson Sound.—The western shore of Secretary Island, which forms the coast line between Doubtful and Thompson Sounds, is almost straight, and runs in a N.N.E. direction for 8 miles to Colonial Head, the North extreme of the island and South entrance point of the inlet. At the distance of little more than a mile from this coast no soundings were obtained at a depth of 300 fathoms.

The main arm of this sound has a general trend of S.E. for 10 miles to its junction with Doubtful Inlet, where it turns to the N.E. by E. for a further distance of 8 miles, and thence S.E. 4 miles. The entrance is perfectly free from dangers, with a depth of 75 fathoms. *Deas Cove*, on its South side, though small, is secure and sheltered. and is the only convenient anchorage in Thompson Inlet.

Nancy Sound.—The entrance of this sound is 3 miles from Thompson Sound, and is well denoted by Turn Peak, a conspicuous sharp-peaked mountain, rising over its northern side to an elevation of 4,120 ft. There is a channel northward of Entrance Islet, but a sunken rock lies in the middle and it is only adapted for boats.

Charles Sound is 4 miles to the N.N.E. of Nancy Sound. Turn Peak, rising midway between it and Nancy Sound, serves as a good guide to the entrance. The trend of the sound for 4 miles is S.E., with a width of half a mile. Three miles from the entrance, close to the North shore, is a small islet, with a cove within, but the shores are steep and rocky, and it is exposed and too small for anchorage. Vessels are not recommended to run for this sound, there being no convenient anchorage.

Caswell Sound.—The entrance of Caswell Sound, 3 miles from Charles Sound, is narrowed by an island, detached from the South head, with a small reef awash off its North end, leaving a passage between it and the North entrance head of $3\frac{1}{2}$ cables in width. To the southward of the island is a boat channel, with a sunken rock in its outer entrance. The trend of the sound is S.E. $\frac{1}{2}$ S. for $1\frac{3}{4}$ mile from the North head, when it turns to the eastward, and increases to the width of a mile. The shores are very steep on either side, 100 fathoms being obtained within a cable, but in mid-channel no bottom at 130 fathoms. Close to the North shore, at the head of the reach, which runs E.S.E., is Boat Rock, just awash at high water; a shoal patch of sand extends round this rock, on which, just above the rock, a vessel may drop her anchor in 4 fathoms, if necessary, but it is very steep. From hence the sound runs

easterly 3 miles, and the best anchorage is 1½ mile above Boat Rock, in a small bight to the eastward of a wooded islet, just detached from the North shore.

George Sound.—From Caswell Sound the steep coast trends N.E. by N. ½ N. to George Sound, which is surrounded by mountains of the most rugged and precipitous character. The first reach of George Sound runs S.E. ½ S. 7 miles, is nearly a mile wide at the entrance, and preserves that width as far up as the anchorage, a distance of 6 miles Twenty-two fathoms was found half a mile off the South head, but rapidly deepening within to 50, 80, and 106 fathoms. With the exception of two small rocky islets on the eastern side, 2 miles within the entrance, and a rock awash 1 mile within the South head, nearly a cable from the western side, the shores are free from danger; and this sound is easier of access and egress than most of the others, in consequence of its greater width, and the winds generally blowing with more steadiness up and down it. There is good anchorage in 15 fathoms in a cove on the North shore, nearly at the head of the first reach.

Bligh Sound is nearly 6 miles N.E. by N. from George Sound. Two remarkable mountains, 3 miles within the North entrance point, Mount Longsight and Table Mountain, the former 4,600 ft. in elevation, will serve to point out the entrance from a long distance seaward in clear weather

This sound has three reaches, in the second of which is *Clio Rock*,* very steep-to, with 9 ft. water over it, on which H.M.S. *Clio* struck in February, 1870. It is the outer rock of a cluster, extending 2½ cables from a bluff point on the eastern shore of the sound. From the narrow bends, Bligh Sound would generally be found difficult of access to a sailing vessel.

From Bligh Sound to Milford Sound, a distance of 16 miles, the coast continues its general trend of N.E. by N., broken by Little and Poison Bays, but unfit for anchorage, and which lie at distances of 3 and 8 miles respectively from the former sound, the bold and cliffy coast line between them projecting to the N.W about a mile from the general trend. In passing along this shore, at a distance of little more than a mile, no bottom was found with from 70 to 160 fathoms of line.

MILFORD SOUND, the northernmost of the series of inlets now described, though comparatively inconsiderable in extent, yet, in remarkable feature and magnificent scenery, far surpasses them all. The mountains by which it is surrounded are the highest on the coast, with the exception of Mount Cook, 120 miles to the north-eastward. *Pembroke Peak*, about 3 miles inland, nearly always snow-capped, rises over its northern side to an elevation of 6,710 ft., and *Llawrenny Peaks*, a very remarkable saddle-backed mountain, attains nearly the same elevation on the southern side; but perhaps the most striking

* Great caution must be used in navigating the sounds on the western shores of Middle Island, as other rocks similar to Clio Rock may exist, and have been left unnoticed by the surveyors.

features are the remarkable shaped *Mitre*, rising abruptly to a height of 5,560 feet immediately over the South side of the sound, and a dome-shaped mountain on the opposite shore nearly bare of vegetation, which, from its peculiar colour, resembles a huge mountain of metal; these Alpine features, and its narrow entrance, apparently still more contracted by the stupendous cliffs which rise perpendicular as a wall from the water's edge to a height of several thousand feet, invest Milford Sound with a character of solemnity and grandeur which description can barely realize. At 27 miles inland, *Mount Earnslaw* will be seen; it is 9,164 ft. high, according to Mr. McKerrow, and is the highest peak in Otago.

From seaward the entrance of Milford Sound makes as a bay, of which St. Ann's is the South point, and Yates Point the northern. They are 5 miles apart in a N. ¼ E. direction; near St. Ann's Point is a remarkable jib-shaped white stripe *Brig Rock*, 10 ft. above water, lies three-quarters of a mile outside a line between these two points, and 3 miles N. by W. from St. Ann's Point.

Anita Bay.—After rounding St. Ann's Point, which is low and rocky, Fox Point, with a small islet close off it, lies half a mile to the S.E., and immediately round it, in Anita Bay, convenient anchorage will be found in from 12 to 18 fathoms, with the small islet bearing North about a cable distant. The head of Milford Sound terminates in two coves or basins, separated by a low tongue of wooded land, fronted by a steep-to tidal boulder-bank. In the eastern of these coves (Freshwater Basin) H.M.S. *Acheron* moored in 12 fathoms. The western cove is larger, with a greater depth of water inside, but its entrance is shallower. It is high water, on full and change, at $11^h\ 15^m$; springs rise 8 ft., neaps 6 ft.

The COAST northward of Milford Sound for the distance of 42 miles, to Cascade Point, is generally free from dangers, except at two or three points marked on the charts, but should be approached with great care. The land immediately over the coast is steep and of moderate height, but is backed by lofty and rugged mountain ranges.

The Southern Alps, whose western abutments reach this coast, are one of the most important ranges of the world: and it is among the slopes and ravines of their flanks, as in the valleys which are covered with the detritus brought down by the numerous watercourses, that those deposits of gold are met with which have attracted such a numerous population that must inevitably tend to the material advancement of the colony hereafter.

Dr. Julius Haast, who has examined much of this most romantic region, says this backbone, as it has been sometimes not inappropriately called, begins at the south-western end of Middle Island, and continues to the East cape of the northern island, broken through by Cook Strait. It reaches its greatest altitude in Otago Province, there clad in a garment of dazzling snow, from which enormous glaciers descend. It presents us with such wild and fantastic forms,

that it has been named the Southern Alps. At the northern boundary of Otago the continuous chain seems to terminate, because North of this the range is singularly broken, and also decreases in altitude. A few of its more remarkable peaks will be noticed hereafter.

A portion of the subsequent description is derived from the remarks of Capt. Charles W. Hope, R.N., who visited the coast in 1867, in H.M.S. *Brisk*, for the purpose of giving additional information for the service of vessels coming on this almost unknown coast.

MARTIN'S BAY is 16 miles northward of Milford Sound, in lat. 44° 20′ S. *Kaduku*, or *Hollyford River*, flowing out of Lake Kakapo or McKerrow, runs into this bay, and is navigable for small vessels drawing 9 ft. into the lake, and as there is a perfectly easy pass of only 1,400 ft. above the sea between this and the great lake Wakatipu (the north-western extreme of the Otago Gold Fields), it may eventually become a haven of importance, as it is said to be capable of much improvement. A settlement was made at *Jamestown*, on the East shore of the lake, and about 6 miles from the mouth of the river, but it is now nearly deserted, from the difficulty of keeping up communication with it.

Just to the northward of Martin's Bay is *Big Bay;* off *Awarua Point*, its North point, a reef is reported to extend 1½ mile westward.

CASCADE POINT, 26 miles northward of Martin's Bay, is a steep projecting bluff, or rather line of cliffs of moderate height, the face bare and striped by numerous falls of water, which after rains pour down its steep sides, and are visible a considerable distance seaward; from this circumstance it has derived its name.

From Cascade Point, the projecting point of Jackson Bay bears N.E. by E. ½ E., distant 10 miles; this latter is a remarkable point, rising boldly from the sea, with a low neck, separating it from higher land.

Jackson Bay is 55 miles northward of Milford Sound, at the South end of a long extent of sandy beach. This bay was occasionally visited by whale ships, from the facility of gaining or leaving the anchorage, as also for chance supplies of vegetables from the natives. It affords good protection from southerly or westerly winds. In making for the anchorage, Jackson Point must be given a berth of half a mile.

From Jackson Bay, the general trend of the coast is N.E. ½ N. for 80 miles, as far as *Abut Head;* the first 20 miles is a nearly straight sandy beach.

TAUMAKI, or Open Bay Islands, are 13 miles N.E. of Jackson Point. Several dangerous rocks have been discovered in the neighbourhood of these islands; and as the coasting steamers frequently pass inside of them, caution is required in doing so, until the nature and position of the several dangers have been determined by further examination.

As described by Capt. Kerley, the anchorage under these islands is sheltered from all quarters, and may be safely used by any vessel. It is situated under the East side of the main island, from the northern point of which a reef of

rocks runs out some distance towards the mainland, and forms an excellent breakwater when the sea sets heavily on the coast from North and N.E. Another reef to the South breaks the force of a South and S.W. sea. A rapid current ran South past the island whilst the *Bruce* remained there; its rate was estimated at between 3 and 4 miles an hour.

River Haast is 5 miles beyond the Taumaki Islands. It is named after the learned explorer, and leads to Haast Pass, the lowest of those which cross the chain of the Alps towards the Gold Fields. The entrance of the river is navigable for small vessels.

Arnott Point.—At 7 miles from Haast River is *Arnott Point*, the first projecting cliffy headland North of Jackson Bay. It has a high conical hill over it. The great Southern Alps here send their steep spurs down to the coast, and in clear weather the summit of the snow-capped and magnificent *Mount Cook*, distant 45 miles, is visible. From Arnott Point the coast is cliffy and almost straight for 15 miles to *Titiara*, or *Tititai Head*, with scattered rocks extending off the points about one-third of a mile. On the next 18 miles of coast line are three sandy bays, the northern of these bays is the most extensive, and has a remarkable range of turreted parapet land near the coast, its North bluff being a conspicuous yellow cliff. Mount Cook is only distant 18 miles from this part of the coast.

BRUCE BAY, in lat. 43° 36′ S. lies between Makawiho and Heritanewha Points, and in its general features resembles Jackson Bay, though smaller. *Weldtown* lies in the head of the bay. The anchorage is close under the South head, in 3 fathoms, with hard speckled sand, but apparently good holding ground. It is well sheltered from all southerly winds. The South head is a bold rocky promontory, stretching out 1½ mile in a N.W. direction, thus forming the shelter, and in the adjoining bay to the southward the same headland affords protection from the only winds to which Bruce Bay is exposed. The vicinity of Bruce Bay to Haast Pass and the gold diggings in that locality renders it an important place of shelter.

MOUNT COOK, or Ahraraigi (Piercer of Heaven), the loftiest summit of the Southern Alps, is only 15 miles from the coast. Lat. 43° 34′ S., long. 170° 11′ E. It is 13,200 ft. high, and for several thousand feet is covered with perpetual snow. Another peak, 1,000 ft. lower, is not far to the N.E. of it. It not only rises very remarkably above all the other snowy giants, but is still more conspicuous from the fact that at its western side it is also separated from *Mount Stokes*, not much inferior to Mount Cook in height, by a steep gap, about 7,000 or 8,000 ft. elevation. It was ascended by the Rev. W. S. Green, with two Swiss guides, in March, 1882, but with great difficulty, on account of the numerous glaciers and avalanches.

Mount Tyndall, the culminating point of another mighty system of mountains, is about 30 miles north-eastward of Mount Cook. It is one pyramidal mass of about 11,000 ft. elevation, and when near is generally connected by a

great many surrounding peaks of nearly equal magnitude. To the West of it is *Mount Petermann*, and S.W. of this is *Mount Keith Johnston*, and the glaciers which issue from these snow-clad summits, and fill up the valleys between them and Mount Cook, serve to form the sources of most of the larger rivers of Middle Island.

From the Yellow Cliffs before mentioned, the coast is a succession of rocky points and bluffs, with occasional sandy beaches between, as far as Abut Head, a further distance of 20 miles.

OKARITO LAGOON is 7 miles S.W. of Abut Head; the river of the same name empties itself into the eastern side of it. It is a regular tidal harbour, the sea flowing and ebbing with great velocity; the flood continues to run in one hour after it is high water in the offing. It is high water, on full and change, at the lagoon, at $11^h\ 40^m$; range about 9 ft.

The entrance is practicable for vessels of light draught, there being 14 ft. over the bar at high water springs. The present channel runs N.W. and S.E. Vessels entering should keep well over to the South shore until abreast the North spit, and then stand straight across for the opposite side to avoid the current setting upon a middle shingle bank.

The holding ground is very bad, and vessels must not trust to their anchors and cables if moored in the tideway. The *light*, formerly shown from the signal-mast, was discontinued on January 1st, 1880. (For Signals, see page 349).

The coast to the northward of Okarito, for a distance of 6 miles, is a low sandy bank, covered with coarse grass and flax, whereas about half a mile to the southward there is a high rocky headland, from which foul bottom apparently extends some distance in a north-westerly direction.

Abut Head is a strikingly bold headland abutting on the coast as a spur from the lofty Mount Cook. From Abut head to Matungitawau Point, bearing N.E. by N. ½ N., distant 68 miles, the coast is for the greater part low and sandy, falling a little back from a straight line, and with few remarkable features. At 9 miles N.E. ½ N. from Abut Head is *Cliffy Head*, the coast between being composed of low cliffs, fronted by a sandy beach, through which the small river *Wanganui* runs into the sea at 7½ miles from Abut Head.

Wanganui River.—The entrance is very narrow, and unsafe for vessels of any description to attempt. The South spit overlaps the mouth, and runs for a considerable distance to the northward, where, from the coast being rock-bound, a vessel endeavouring to take the bar, and stranding, would without doubt become a wreck.

The coast between Wanganui and Okarito should be approached with caution, as the rocks from the headlands apparently run a considerable distance seaward.

BOLD HEAD (*Paramata*).—At 13 miles N.E. of Cliffy Head is Bold Head, as its name imports, a bluff point, standing out from the low coast on either

side of it; but lying in a bight or recess of the coast, it forms no very prominent object from seaward. Bold Head, lat. 42° 57′ S., long. 170° 42′ 15″ E., was reached by a land expedition under Messrs. Brunner and Heaphy, in March, 1846. They started from Nelson, and to their remarks the first delineation of the coast was owing. For about 30 miles from Bold Head the coast is low, with a sandy beach. At 5 or 6 miles beyond Bold Head is the entrance of the Totara River, a very small stream, near the mouth of which is the recent town of *Ross*, at 11 miles southward of Hokitika River.

Arahura or *Greenstone River* was crossed by Messrs. Brunner and Heaphy. It is small, and 5 miles beyond the Hokitika. Five miles from its mouth is the town of *Goldsborough*.

HOKITIKA or Brunner River, in lat. 42° 45′ S., long. 170° 57′ E., is navigable for vessels of a light draught of water to the distance of 1½ mile from the entrance, but the bar is so constantly shifting its position that no directions for entering could be depended on, local pilotage alone being reliable There is anchorage from 2 to 3 miles off its mouth in 8 to 10 fathoms, with good holding ground of dark sand.

Hokitika, the capital of Westland province, had a population of 2,600 in 1881, which number was not on the increase. It has a large trade with the Australian colonies; besides its gold exports, great quantities of timber are shipped.

Lights.—On Gaol Hill, about 1⅛ mile northward of the flagstaff at the river entrance, is a white wooden lighthouse, 18 ft. high, from which is shown a *fixed bright* light, elevated 122 ft., and visible 16 miles in clear weather.

When the entrance channel runs near or along either the North or South walls, a *fixed green* light will be shown on the end of the wall that the entrance channel approaches nearest, but when the walls are overlapped by the spits, it will not be shown.

The best anchorage off Hokitika is in 15 fathoms, with the flagstaff, at the North side of the entrance of the river, bearing E.S.E., distant 2¾ or 3 miles, veering cable to 60 or 70 fathoms; this is in good holding ground, and a vessel may here ride in safety except with westerly winds.

Vessels intending to take the bar, being obliged to anchor to await daylight or high water, should bring up a little to the southward of the port; for although there is a southerly current in the offing, a strong northerly set will often be found within the break on the bar.

A constant heavy westerly swell rolls in on this portion of the coast; and although the prevailing gales blow from N.W., S.W., and S.E., enabling vessels to lay well off shore and obtain an offing, masters of vessels should not neglect watching the weather carefully, and, in the event of its threatening, put to sea in good time.

The heaviest break of the sea at Hokitika is immediately outside the bar, in 2 fathoms. The bar is constantly shifting in direction and varying in depth;

after a heavy fresh, the stream of the river runs straight out to sea, and during an interval of moderate or fine weather the sea piles up either the northern or southern spit, forming a series of middle banks with channels between, the depths averaging from 12 to 18 inches only at low water.

It is high water, on full and change, at Hokitika Bar, at $9^h\ 39^m$, and the mean rise from 8½ to 9 ft., but this rise is greatly affected by the state of the river.

Teremakau River is 11½ miles beyond the Hokitika, and 8 miles to the southward of Grey River, or midway between the Grey and the Hokitika; at the present time it empties itself into the sea by two channels, one running northwards, which is nearly dry at low water, and the other in a S.W. direction, with 5 or 6 ft. water in it. The entrance is not so confined as the Grey, but it is not equal to the Hokitika. Small vessels, drawing 4 or 5 ft. water, could cross the bar without incurring greater risk than they would at either of the other rivers. It is high water, on full and change, at $9^h\ 55^m$; mean rise, 9 feet.

GREY or Mawhera River, in lat. 42° 28′ S., long. 171° 12′ E., like all the other rivers on the West coast, has a bar at the entrance, which is constantly shifting, rendering the navigation of vessels entirely dependent on local pilotage. Works are now being carried on to deepen the entrance

The coal mines at *Brunner*, which will make the river of much greater importance, are being worked at 7 miles from its mouth, and a railway is constructed to them; the output in 1881 amounted to 25,436 tons. Gold is the chief article of export. The population of the town of *Greymouth*, situated on the South bank of the river, was 2,544 in 1881.

Lights.—A *fixed bright* light is shown from the flagstaff on the South side of the South training wall. On the South shore two *fixed red* lights are shown, and a *green* light at the extremity of the harbour works in progress.

At the end of Arney Street two *beacons* have been erected, as leading marks for the new channel formed in the South spit. Strangers are warned not to take the South channel while the North channel is open, as the semaphore is not adjusted for the South channel.—*Victoria Government Gazette*, 1876. In 1878 it was announced that consequent on the shifting of the channel, a flagstaff had been temporarily placed on the South shore, from which tidal signals would be shown.

After a heavy fresh, when the channel breaks out straight in a westerly direction, it is safe and easy of access for vessels drawing 8 or 9 ft.; but in the absence of any fresh in the river, the channel makes either to the North or to the South, but usually to the North, running for a short distance nearly parallel with the coast line, and at such times the entrance of the Grey is far more dangerous than that of Hokitika River, because, in crossing the bar, the sea takes the vessel on the beam when in the heaviest break, and unless under command with very small helm she is in danger of being stranded on the

beach before getting in a position to keep away for the entrance of the river, which latter, although deep, is very narrow. It is high water, on full and change, at $10^h\ 15^m$.

At about 35 miles North of Grey River is a group of peaks, called by Cook, and also by D'Urville, the *Five Fingers*. The coast in this space is iron-bound, with the exception of a beach about 8 miles long, not backed by any level country.

CAPE FOULWIND, a projecting part of the coast, lies about 17 miles North of the Five Fingers Rocks. The cape itself is a low cliffy point, well wooded, the land within rising gently to the base of the mountains to the southward. Off it are the conical rocks called the *Three Steeples*, visible 10 or 12 miles off, their northern extreme being 2½ miles N. ½ W. from the cape. The cape is low and covered with trees, lat. 41° 46′ S., long. 171° 34′ E.

LIGHT.—On Cape Foulwind is a white wooden lighthouse, 53 ft. high, exhibiting a *revolving bright* light, attaining its greatest brilliancy once every half minute, elevated 190 ft. above high water, and visible 19 miles in clear weather.

From Cape Foulwind the coast recedes to the eastward, and forms an extensive bight, of which Rocks Point, 54 miles to N. by E., is the northern limit; the depth of the bight from a straight line between the two points being about 15 miles.

BULLER RIVER, or *Kawatiri*, about 7½ miles East from Cape Foulwind, is described as being the most easily navigable of all the numerous streams on the West coast, having a great depth of water on the bar, and the advantage of being sheltered from the prevailing south-westerly swell by Cape Foulwind. A large township, *Westport*, has been formed at the mouth of this river, which had a population of 1,013 in 1881. There is a railway to the coal fields, and extensive river protection stone-works are in course of construction, expected to make Westport the best in New Zealand for vessels up to 1,000 tons burthen.

Between Cape Foulwind and Buller River there is probably good anchorage in the bay, where vessels may lie sheltered during southerly and S.W. winds. It is important that all craft trading to the West coast rivers should be provided with good hawsers and a spare anchor.

Vessels taking shelter in the bay should, with the wind from seaward, get under way on the ebb tide, as the flood sets towards the Steeples.

The bar at the entrance of Buller River lies E. ¾ N., 5¼ miles from the outer Steeple Rock. Vessels bound for the river should be guided by the signals made at the flagstaff (see page 349), and in crossing the bar keep the flagstaff and beacon in line, paying attention to the semaphore arm, as a strong current at times sets across the entrance, and the bar is liable to shift.

By night, a *fixed bright light*, visible 6 miles, is shown from the flagstaff,

and a *red light* from the beacon. By day a red flag is hoisted on the beacon. The pilot only boards *inside*.

Commander H. L. Percival, H.M.S. *Falcon*, states that a sunken rock, having 2 or 3 ft. over it at low water, lies midway between the North extreme of the Three Steeples and the entrance of the River Buller.

This rock was searched diligently for but in vain by the harbour master of Westport, Buller River, in the Local Government steam-vessel *Luna*, in November, 1873, under favourable conditions of wind, weather, and tide. The rock seen was probably one of the known outlying dangers a few hundred yards E. by N. from the northern Steeple.

At 18 miles N.E. from the Buller River is the mouth of the *Ngakuhau*, North of which is a sandy beach, to which, however, the mountains approach closely. At 4 miles farther is the mouth of the *Mokihinui River*, whence the coast has an ironbound character for about 8 miles in a N.N.E. direction to a sandy beach, 16 miles in extent, through which the *River Karamea* flows. *Heaphy* or *Wakapoai River* is 5 miles southward of Rocks Point. The entrance is remarkable between two high bluffs sloping to the sea.

Rocks Point is in lat. 40° 58′ 30″ S., long. 172° 6′ 15″ E. The coast for about 11 miles to the South of it trends nearly true North and South, a snowy range approaching close to the sea. Numerous small streams have their mouths along this coast, and there are two larger ones, the Wakapoai or Heaphy, 5 miles South of Rocks Point, and the *Haihai*, at its southernmost extremity. From Rocks Point to the N.E., for a distance of about 29 miles, to Wanganui, the coast is rocky and ironbound, steep spurs from the high mountains, composed of granite and gneiss, come down into the sea.

Stewart Breakers (Kiourangi Shoal), first reported by Capt. Stewart, of the schooner *Dunedin*, in 1873, were further examined and ascertained to consist of rocky ground three-quarters of a mile long and half a mile broad, having near the southern end a depth of 3¼ fathoms. From the shoal, Kiourangi Point bears S.E. by S. ½ S., distant 4¼ miles. The shoal, which lies in lat. 40° 44′ 40″ S., long 172° 12′ E., should be approached cautiously in rough weather, but the channel in-shore of it is safe.

WANGANUI INLET lies about 8 miles S.W. of Cape Farewell. The entrance shows distinctly from seaward; the points are somewhat remarkable, being high and sloping gradually to the sea, with more elevated land behind; the South head, after sloping, rises again in a cone from the water's edge, and presents a yellowish cliffy projection. *Mount Burnett*, or Knuckle Hill, with its double summit, which is so conspicuous an object in Massacre Bay, bears E.S.E. distant 6 miles from the entrance. Extensive coal beds exist in the locality of Wanganui Inlet, probably of the same formation with those in Massacre Bay.

The bar, which stretches across from the heads, has 6 ft. at low water, and may be crossed at high water by vessels of from 10 to 12 ft. draught, the

deepest channel being close along the southern shore; when inside the water deepens to 3 and 4 fathoms. The inlet, after running in a S.W. by S. direction for little more than 1 mile, separates into two arms, taking a N.E. and S.W. direction or parallel with the coast; the N.E. arm is shallow, and almost dries at low water. There is anchorage in 4 fathoms 1 mile within the entrance close on the southern shore; but to enter, moderate weather and a leading wind is necessary S.W. winds blow down the southern arm, and generally right out of the harbour. The bar at the entrance has not been closely examined, but vessels of the draught before mentioned have crossed it.

It is high water, on full and change, at Wanganui Inlet, at $9^h\ 20^m$; springs rise 6 and 7 feet.

From Wanganui Inlet the coast trends N.E. ½ N. to Cape Farewell, distant 8 miles. *Curious Cliff*, at 3½ miles from Cape Farewell, is a remarkable piece of table land, its northern end having fallen away by a landslip; close to the shore, in front of it, is a small perforated rock, *Archway Islet*. Several scattered rocks lie off the adjacent coast, apparently fragments broken from the cliffs.

CAPE FAREWELL, the northernmost point of Middle Island, has been before described on page 441.

The LIGHTHOUSE on *Bushend Point* of Farewell Spit, has also been described. It is an open framework 113 ft. high, showing a *bright revolving* light every minute, except when bearing between N.W. ¼ N. and W. by N. ½ N. in the direction of the spit, when it is *red*.

S.W. winds on this part of the coast generally veer to the westward, and draw into Cook Strait after passing Cape Farewell.

This completes the circuit of the islands.

CHAPTER X.

ISLANDS BETWEEN LATITUDES 20° AND 40° SOUTH.

The immense extent of ocean comprised in this belt of the South Pacific, between the coasts of Chile and Australia, has but few, very few, spots of land in the southern portion. In the northern half the coral groups of the Low Archipelago extend to the South of, or within, our present limits, but will be described in a separate section hereafter. In pursuance of the system stated on page 305, we return from the description of New Zealand in the West to the lower latitude on the South American coast, and thence again proceed to the westward.

JUAN FERNANDEZ ISLANDS.

This group, if it can be so designated, consists of two chief islands, at a considerable distance asunder, with some smaller ones attached to each. Their name is derived from Juan Fernandez, a Spaniard, who discovered them in his voyage from Lima to Valdivia, in 1563. He designed to settle here, and requested a patent for them, but did not obtain it. It was much visited by the buccaneers in their marauding expeditions against the Spaniards, and Dampier describes his visits here. In 1681 a Mosquito Indian was left on it by the ship Dampier was in, and was taken off by him in March, 1684, he having lived three years solitarily upon the goats first introduced by Fernandez. In February, 1709, Capt. Woodes Rogers touched here, and found the well-known hero, Alexander Selcraig, or Selkirk, who had been left on it by the ship *Cinque Ports*, Capt. Stradling, four years and four months previously. Dampier having been both in the ship he was landed from and that which took him off. Selkirk gave an account of his sojourn to Daniel Defoe, in order to prepare it for the press, and from the ideas there given the excellent romance of Robinson Crusoe was formed. In the visits above mentioned, a prodigious number of goats were found, and these were reduced by the Spaniards, who introduced dogs for the purpose of destroying one of the principal refreshments of their enemies the buccaneers. These animals were both found in possession of the island by Lord Anson, with the miserable

remnant of his crews in the *Centurion*, the *Tryal* sloop, and the *Gloucester*, in June, 1741. Every one is familiar with the terrible descriptions of the havoc made by the scurvy in these ships, and the restoration of the survivors to health in Juan Fernandez. Men thus saved from utter destruction would naturally paint in glowing colours the scene of their deliverance; and these accounts leading to the supposition that the English would colonize both Inchin, in the Chonos Archipelago, and Juan Fernandez, the Spaniards sent a colony in 1751, but it was soon after almost totally destroyed by the dreadful earthquake, a calamity the island has since been subject to on more than one occasion. It was still inhabited when Carteret visited it in 1769. In 1819 the Chilian Government formed it into a penal colony, but it was not much kept up, on account of the expense. When Capt. P. P. King, in H.M.S. *Adventure*, was here in 1830, it was occupied, or rather rented from the Chilian Government for a term of years. In 1835 this prison colony had been increased, and the prisoners rose on, and for a short time overcame, the troops. After this it was deserted.

It is now leased to a Chilian merchant; several families, amounting in all to about fifty persons, residing under his care, cultivating the land, stacking wood, and attending to the cattle, which were fine and fast increasing. During the season they go to Masafuera, 90 miles distant, for seal skins, of which they annually obtain about 2,000. About twenty-five American whalers had annually called for supplies.

Fresh water is good, and easily procured; wood can be purchased; beef of excellent quality, pigs, poultry, vegetables, and fruit, can be obtained at a moderate rate. Peaches grow wild in large quantities; wild goats are numerous, and the bay has fish in great abundance.

The climate of Juan Fernandez is mild, and is considered healthy, but the weather is very changeable. The mornings are generally cloudy, with showers of rain. Towards noon the weather clears up; the afternoons are clear and pleasant; towards midnight the clouds begin to gather on the high lands, which spread over the island. Squalls come down the valleys and showers of rain, which again clear up as the day advances. This is said to be the general state of the weather for eight or nine months of the year.—*Capt. P. Masters.*

The principal islands are Juan Fernandez, called for distinction *Mas-a-Tierra*, because it is nearest the continent, and *Mas-a-Fuera*, or "more in the distance," which is about 92 miles westward of it.

JUAN FERNANDEZ, 360 miles westward of Valparaiso, is about 12 miles long by 4 miles board, and 3,000 ft. in height. It has several bays, and its general appearance is thus described by Capt. P. P. King, who anchored in Cumberland Bay, on its North side, January, 1830.

"I have seldom seen a more remarkable and picturesque view than is presented by the approach to Juan Fernandez. When seen from a distance, the

mountain of the 'Yunque' (anvil), so called from its resemblance to a blacksmith's anvil, appears conspicuously placed in the midst of a range of precipitous mountains, and is alone an object of interest. It rises 3,000 ft. above the shore, which is formed by an abrupt wall of dark-coloured bare rock, 800 or 900 ft. in height, through whose wild ravines, broken by the mountain torrents, views are caught of verdant glades, surrounded by luxuriant woodland.

"The higher parts of the island are, in general, thickly wooded, but in some places there are grassy plains of considerable extent, whose lively colour contrasts agreeably with the dark foliage of myrtle trees which abound on the island.

"The Yunque is wooded nearly from the summit to its base, whence an extensive and fertile valley extends to the shore, and is watered by two streams, which take their rise in the heights and fall into the sea.

"The remains of a fort, called San Juan Bautista, are yet in a tolerable state. It is situated on a rising ground, about 130 ft. above the sea, at the S.W. part of the bay, and overlooks the village. In the middle of the beach are some ruins of a four-gun battery, and there are traces of a fort at the N.W. end of the island.

"By sending a boat to the East point of the bay, to fish in 40 fathoms water, a most delicious kind of codfish may be taken in such numbers, that two men in half an hour could fill the boat. Crawfish, of large size, are almost equally abundant; they are taken with a hooked stick. One of our boats caught forty-five in a very short time. The inhabitants catch them and cure their tails, by exposure to the sun, for exportation to Chile, where they are much esteemed, and fetch a high price.

"Fort Juan Bautista is in lat. 33° 37′ 45″ S., long. 78° 53′ W."

French Bay is small, and the curve which forms it differs but little from the direction of the outer part of the coast. It affords no shelter, and is situated at the bottom of a valley which rises quickly to the high land, presenting a pleasing appearance, being well covered with trees, some of which were very large. Between French and Cumberland Bays there appeared to be no landing place.

Cumberland Bay, on the northern side, 3 miles from the eastern extremity, lies exposed to northerly winds, and in the months when these winds prevail no ship should anchor in it; it curves in from the heads which form the bay upwards of a mile. The western head, which divides Cumberland from English Bay, is a precipice upwards of 200 ft. high; the face of it is of a deep brown colour, and the eastern head has the same appearance with regard to its formation. The bay has good anchorage for vessels of any size.

Light.—From a lantern on the mole in Cumberland Bay a light is exhibited, which may be seen from a distance of 4 or 5 miles.

A vessel approaching this roadstead from the southward may pass round

either end of the island according to circumstances; but she should not approach the shore nearer than a mile, to avoid the eddy winds down the valleys. In the event of taking the eastern end, which is the best, when off Bacalao Point, Cumberland Bay will open out, and also some caverns which will be seen on the face of the first high land rising from the beach; and when the western part of West Bay shuts in with the western point of Cumberland Bay, deep soundings will be obtained. The ship should anchor with the next cast in about 25 fathoms, on a bottom of fine clear sand, about a quarter of a mile from the beach.

The marks for the best berths are, a small rock off the West point of the bay, which just shows at high water, N.W. by N. $\frac{1}{4}$ N.; the easternmost of the caverns, of which there are six in number, about S.W. $\frac{3}{4}$ W., or the fort W.S.W. In approaching the bay from the westward, keep about a mile from the shore, and when the caverns over Cumberland Bay are well open run towards them, and anchor as above directed.

All vessels visiting this bay should moor, placing the in-shore anchor in about 16 fathoms, and the off-shore anchor in 35 fathoms; the ship will then be in a good berth with a southerly wind, and have room to veer, should the wind come in from the northward. In the summer season southerly winds prevail, and at times heavy gusts rush down from the valleys; consequently, the bottom being of sand, a good scope of cable on the southernmost anchor is necessary. A kedge astern will serve to keep the hawse clear.

It is high water, on full and change, in Cumberland Bay, at $9^h\ 30^m$; the rise of tide is about 4 ft.

English Bay, although not so well sheltered, has a better appearance from the sea than Cumberland Bay. The ground about it is not so much broken, and rises with a more gentle ascent towards the high land. It was in this valley, which runs up from the bottom of the bay, that the celebrated Alexander Selkirk is said to have lived.

Santa Clara, or Goat Island, to the S.W. of Juan Fernandez, is thus described by Mr. Bennett, in his whaling voyage:—It does not exceed 4 or 5 miles in circumference, and is of moderate elevation. Its summit is surrounded by many conical eminences or hummocks. Its western extremity is bluff, whilst the eastern descends gradually to the water's edge. Its shores are precipitous, and chiefly composed of a brown volcanic stone, presenting on the faces of many of the cliffs tortuous columnar projections, resembling the trunks and branches of trees embedded in its structure. This islet has a burnt and desolate aspect, and affords no vegetation higher than a stunted shrub; whilst the few verdant patches of soil tend rather to heighten by contrast, than to relieve, the general sterility of its appearance. On the North side, and towards the western extremity, a run of fresh water empties itself into the sea over the face of the cliffs. Landing is effected with difficulty, and fish is very abundant.

MAS-A-FUERA, the second island of the Juan Fernandez group, is 92 miles westward of Juan Fernandez, the summit being in about lat. 33° 46′ S., and long. 80° 46′ W. Captain Masters says it is stated to be more capable of cultivation than Juan Fernandez, and that a greater number of seals frequent it. There were at the time of his visit, in 1835, 10 or 12 persons on it, free settlers from Chile, and the crop of potatoes in that year was 800 bushels, besides other vegetables. It appears that there is one place where a boat can land on it with safety, but as a rule the surf on the rocks prevents the approach of a boat. Fresh water is good and plentiful, also wood.

The island is about 8 miles long North and South, and 5 miles broad, the summit, near the centre, rising to about 4,000 ft. high. On the S.W side is a remarkable perforated rock, 1½ mile northward of which a reef extends about three-quarters of a mile W. by S. from a low point, with the sea continually breaking on it. No other detached dangers are known. There is no convenient anchorage, but the best is on a bank extending from the N.W. side of the island, with 20 to 30 fathoms, fine black sand and shells. H.M.S. *Dolphin* anchored in 24 fathoms, black sand, on the East side of the island, near the S.E. point, there being 15 fathoms within 2 cables of the shore.

ST. AMBROSE AND ST. FELIX.

These two islands, or groups, belonging to Chile, lie nearly 500 miles off Copiapo, in Chile, and were only visited for the purposes of fishing or procuring water from St. Ambrose; but the difficulty of finding secure shelter diminishes their value. In former years immense herds of seals frequented their shores, but these have almost all disappeared; their pursuit is no longer profitable. There was a small quantity of guano. These islands appear to be unconnected with the South American Continent or with the Juan Fernandez group, as soundings were obtained by H.M.S. *Alert*, in 1880, in over 2,000 fathoms between them. They were surveyed by Captain Gormaz, of the Chilian war-vessel *Covadonga*, in 1874, and some of the subsequent particulars are derived from his report.

ST. AMBROSE is the easternmost, and is about 4 miles in circumference, rising to a height of 720 ft. On the North side there is a snug little cove for a boat, and a good landing at all seasons of the year, with the wind blowing from any southerly point between East and West. About the centre of the North side, however, there is still better landing, where fresh water of an excellent quality might be had in any quantity from a pond on the top of the island, and led down to the boats wtih a hose. Capt. Gormaz, in 1874, and Capt. Maclear, R.N., in 1880, describe the island as being without water,

except after the rains, when it collects in cavities in the rocks, and quickly disappears.

Captain Maclear, of H.M.S. *Alert*, 1880, describes St. Ambrose as 1,500 ft. high, and composed entirely of volcanic scoriæ arranged in horizontal strata very marked, and intersected by vertical dykes of basalt which have the appearance of streams flowing from the summit when viewed at some distance: vegetation is scant, and the island is without water. There is no anchorage off the island, 20 to 30 fathoms having been obtained less than a cable's distance off shore. Landing was effected at two places on the North shore; and, with southerly winds, might also be effected in most of the coves on the North shore; but the island is steep and rugged, and the ascent to the summit would be both difficult and dangerous.

A remarkable rock, 195 ft. high, very much resembling the "Bass" in the entrance of the Frith of Forth, lies off the East end of this island, and a small, rugged, conical-shaped rock to the eastward of it again, distant about one-third of a mile, with a sunken rock between. The large island (St. Ambrose) is about 1½ mile from East to West, the Bass-like rock being almost connected with it. Through the West part of the "Bass" is a remarkable fissure, leaving a cavity through at the water-line, and apparently 20 ft. high, shaped as a triangle.

About 9 miles to the westward of St. Ambrose are the Isles of St. Felix, grouped close together. These islands all seem to be volcanic, and are without an appearance of verdure; they are all, including the "Bass," much marked by the numerous birds which frequent them. Fish is plentiful around the shores of St. Felix. Captain Bruce makes the West point of St. Ambrose to be in lat. 26° 21′ S., and long. 7° 53′ 30″ W. of Fort St. Antonio, at Valparaiso, or 79° 40′ 30″ W. M. Du Petit Thouars makes it 14′ farther W. By the Chilian survey it is in lat. 26° 19′ 45″ S., long. 79° 49′ 45″ W.

ST. FELIX is 9¼ miles West of St. Ambrose, and consists of two islands connected by a reef. On its West and S.W. sides it shows steep and perpendicular cliffs, but there is a place for landing on the N.W. side, about one-fourth of a mile eastward of Morro Amarillo, the N.W. head or bluff, which is about 600 ft. high. Here, in a sort of gulley, you may land on a flat rock at all seasons of the year; but on the beaches at the North and East sides of the island the landing is dangerous, as the shores are steep. Captain Colnett's people landed on the North side of it with great risk and difficulty, and traversed the island, which produces nothing but a plant resembling the common nettle, of a salt taste, and disagreeable odour. They could find no fresh water, and the soil was mere sand, from one to six inches deep, on a solid rock, and furrowed by heavy rains. No living thing except flies were seen; but great numbers of addled eggs. Fish is plentiful around the shores.

Captain Bruce says:—One of the St. Felix Isles is low and long, about 2

miles in extent, having a peaked hill at its West end. The East hill is high and sugarloaf-shaped, and the westernmost is a jagged and very peculiar looking rock. The surf beats heavily against every one of them, even on their lee sides, though the water with us was smooth; and nothing like a possibility of landing could be entertained from our view of them. Colnett says:—When South of the western isle (*St. Felix*) the whole has the appearance of a double-headed shot; but the easternmost hummock is separated from it by a very narrow reef, which divides it, as it were, into two isles; the lowest land commencing with the reef, and joining the hummock to the West.

About 11 cables N.W. ¾ N. from the N.W. point is a remarkable islet, 170 feet high, which has been named *Peterborough Cathedral*, and which in most points of view will resemble a ship under sail. It is placed by Captain Harvey, R.N., in 26° 16′ 12″ S., long. 80° 11′ 43″ W.; by the Chilian survey of 1874, it is in lat. 26° 15′ 45″ S., long. 80° 0′ 45″ W.

The position of St. Felix, according to the observations of Malespina, May, 10, 1793, is lat. 26° 20′ 15″ S., long. 79° 49′ W.; by the Chilian survey, the landing place is in lat. 26° 16′ 46″ S., long. 80° 0′ 15″ W. It is high water, on full and change, at 9ʰ 40ᵐ; springs rise about 7 ft. The *Covadonga* anchored in 10 fathoms, fine black sand, about 3 cables off shore, and 6 cables N.N.E. of the landing place.*

SALA-Y-GOMEZ was discovered in 1793, by the Spanish commander of that name. It was again visited by the Spaniards in 1805. An American, named Gwyn, reported, in 1802, a rocky island on the same parallel, but 5° to the West; but it is probable that it is the island in question for in Kotzebue's search for it he found only that discovered by Captain Gomez, consequently *Gwyn Rock* is no longer placed on the charts. Admiral Beechey examined it, and found Kotzebue's latitude 2 miles in error, probably a typographical mistake. It is an isolated spot, of less extent than had been stated, being scarcely more than a heap of rugged stones, apparently thrown together by the elements, and in a gale of wind would not be distinguishable amidst the spray; its highest part, at the S.E. end, rises to 98 ft. The rocks, except such parts as have been selected as roosting places by the sea-gulls, are of a

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* Doubtful Dangers.—Captain Juan E. Lopez, commanding the Chilian corvette *O'Higgins*, 1874, searched for the following dangers separately, devoting two or more days to cruising over the supposed positions of each danger, and sounding to the depth of 465 fathoms without obtaining bottom, or perceiving any indication of shoal water; they have therefore been erased from the charts:—Reef, 31° 58′ S., 95° 09′ W.; Buchile Island, 26° 21′ S., 92° 24′ W.; Island, 27° 58′ S., 95° 00′ W.; Gray Island, 26° 23′ S., 94° 33′ W.; Gray Island, 25° 30′ S., 94° 32′ W.; Pilgrim Island, 24° 36′ S., 104° 33′ W.; Waihou Island, 22° 06′ S., 108° 40′ W.; Island, 31° 11′ S., 110° 30′ W.

A small rock awash has been occasionally reported by masters of Chilian vessels, in lat. 29° 34′ S., long. 87° 31′ W.

dark brown colour. Upon a small flat spot there was a moss-like vegetation, and near it a few logs of wood, also noticed by Sala-y-Gomez.

"When first seen, the island has the appearance of three rocks. (It was seen at daylight 15 miles off, bearing N.N.W.) Its direction is N.W. and S.E., and is something less than half a mile in length, and a fifth of a mile in width. Some sunken rocks lie off the N.E. and S.E. points; in other directions the island may be approached within a quarter of a mile. N. 50° W., three-quarters of a mile, there are soundings in 46 fathoms, sand and coral; and N. 33° W., 1½ mile, 140 fathoms, gray sand."—(*Beechey*). The S.E. extreme is in lat. 26° 27′ 46″ S., long. 105° 50′ 8″ W. Capt. Lopez places its N.W. extreme in lat. 26° 27′ 41″ S., long. 105° 28′ W.

Scott Reef.—Captain H. Scott, of the British barque *Druid*, reported (in 1855) that a very dangerous patch of breakers existed, as near as he could ascertain, about 5 miles N.N.E. of Sala-y-Gomez. Capt. J. E. Lopez, Chilian corvette *O'Higgins*, during a survey of the island in 1875, found no bottom at 465 fathoms in this position, but found a reef, on which the sea breaks, about 1 mile N.E. ¼ N. of Sala-y-Gomez, which is supposed to be Scott Reef. It is about 100 yards long East and West, and 50 yards broad, with 16 to 19 fathoms close around it.*

EASTER ISLAND or RAPA NUI (*Great Rapa*), also called *Teapy* or *Waihu*, is one of the most interesting spots in the Pacific. It is remarkably isolated, as it is 2,030 miles from the coast of Chile, and 1,500 from the nearest inhabited island, except Pitcairn Island, so that its people and their history is an ethnographical problem worthy of much consideration. The island is too small to sustain a large population, and water is not very abundant.

It was discovered by Roggewein, on Easter Sunday, 1721. Cook and La Pérouse visited it, and their accounts invested the island with great interest. It was surveyed by Admiral Beechey in the *Blossom* in 1825. The visit of H.M.S. *Topaze*, November 1st to 7th, 1868, has furnished us with more complete particulars. These are from a report by Commodore Powell to the Admiralty, and a most interesting paper by John Linton Palmer, Esq., R.N., F.R.G.S., which is given in the Journal of the Royal Geographical Society, vol xl. 1870. In June, 1882, the island was visited by Commander B. F. Clark, in H.M.S. *Sappho*, and the information then gained has been incorporated in the following description.†

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* Further particulars of the foregoing islands, and Easter Island, as derived from the Chilian surveys, will be found in the "Anuario Hidrografico de la Marina de Chile," 1881, p.p., 164-190, published at Santiago.

† Easter Island was also visited by the French traveller, M. Pinart, in the French vessel *Seignelay*, in 1877, and by Commander Geiseler, of the Prussian gunboat *Hyane*, in

Commercially the island was most unimportant; producing nothing to invite the visit of traders. But in 1863 a dreadful outrage was perpetrated on the unoffending natives. As they describe it, a number of ships under Peruvian colours anchored in the bay, and their canoes crowded round the vessels to barter, when suddenly they were all seized, bound up, and stowed away. Some of the ships' crews landed, and chased the unfortunate remnant, carrying away all they could seize, and took them to the Chincha Islands to work the guano. A large proportion of them soon died under this slavery, and when the Peruvian government caused the survivors to be sent back to their native island, most of them died on their passage, and even the restitution of the few survivors was a great calamity, for they brought with them the small-pox, whose ravages greatly reduced their lessened numbers. Prior to these calamities there were about 3,000 inhabitants, a number probably liable to little fluctuation, who were divided into tribes, each occupying a small portion of land and who periodically elected a king, chosen for the singular qualification of having collected the largest number of sea-birds' eggs.

The scandalous transaction above related caused the Roman Catholic Bishop of Tahiti to send a Jesuit missionary, with a lay brother and four Kanakas, in 1864, to protect and civilize the remnant. They found about 1,500 people on the island, and their efforts were crowned with complete success. They entirely changed the character and habits of the uncivilized natives. When the *Topaze* came in 1868 they found the people the most happy in the world, and apparently as good as they were happy. The devotion of the Jesuits was beyond all praise. But there were only about 900 left, who lived near Cook's Bay, and seemed to be complacently awaiting their doom. In complexion they are very light, almost white, mostly resembling the Marquesans, but thought by some to far surpass this reputed handsome race in personal beauty. Their language is Polynesian.

In 1878, the "Maison Brander," a firm of Tahiti, purchased the property of the missionaries on Easter Island, who then went with about 300 natives to the Gambier Archipelago. Previous to this about 500 of the natives were taken to Tahiti to work on the sugar plantations of the "Maison Brander," so that at the time of the visit of H.M.S. *Sappho*, in 1882, only 150 natives remained, among whom there was no trace of the missionaries' work. A large grazing farm has been established, under the superintendence of Mr. A. Salmon, and there are now about 10,000 sheep and 400 cattle on the island, rapidly increasing, besides great numbers of semi-wild poultry. Vegetables are at present scarce, but grow readily.

The origin of this interesting people is one of the most important problems

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1882. The latter compiled an interesting report of his visit, which was published in Berlin; the account of the former was published in the "Tour du Monde," vol. xxxvi., p. 225.

connected with the migration of races. They have but one tradition, which is, that ages ago their ancestors came in a large boat from Rapa (Opaṛo), next described, which is 1,900 miles to the *westward*. They landed at Ounipu, a bay on the East side. Their king was with them, and he made the statues (of which there are such large numbers) out of a quarry that was in a crater on which he lived.

How these early navigators in their canoe managed to reach this lonely spot in the teeth of the usual trade wind, is one of those mysteries, the solution of which would clear up many difficulties in the history of the early races and civilization of Peru and Central America. The character of those architectural and other remains evidently point to an eastern origin. This little island and its ancient sculptures, therefore, as a stepping-stone to the solution of this question, is of more than ordinary interest.

Its position will afford some little clue to the mystery of its original settlers. It is near the southern verge of the S.E. trade, which blows constantly during the southern summer, October to April, being strong for about a fortnight, when it commences and leaves off. During the rest of the year it is in the tropical variables; for a few months westerly winds prevail, which bring much rain. It is therefore probable that this was the time of the voyage, but how such a craft could be guided due East without a compass will be a mystery to modern navigators. The peculiar build and rig of the Polynesian canoe or prahu will readily explain away any difficulties as to variation in the direction of the wind, to which they sail so near. The currents hereabout will be very uncertain, being in the zone between the westerly and north-easterly drifts.

The sculptured remains and terraced platforms of former inhabitants have struck every visitor with astonishment. They have been more minutely examined by the officers of H.M.S. *Topaze* than had been previously done, and Mr. Palmer, the surgeon, has given ample descriptions of their character and localities in the paper before referred to.

The great stone busts or images which are scattered over the island in very great numbers, amounting to several hundred, are the most remarkable; they are usually from 15 to 18 ft. high, and in one case 34 ft. They are all formed of one material, a gray compact lava (trachyte), found in the crater of Otuiti, at the N.E. end of the island, where unfinished ones are still to be seen. In form they are trunks, terminating at the hips, the arms close to the side, the hands sculptured in low relief, and clasping the hips. The head is very flat, the top of the forehead cut off level, so as to allow the crown to be put on. The crowns (hau) are made of *red* tufa, found in the Terano Hau crater, in shape short truncated cones, or nearly cylindrical. The face is square, massive, and sternly disdainful in expression, the aspect always upwards. Mr. Clements Markham says it is impossible not to be struck with the resemblance between these remains and those of the Aymara, an ancient Peruvian race. On Easter

Island each of these figures has its special name, but they are not idols. Some are of immense age, others much more recent.

The next remains which are of the greatest age are the sculptured stones, on the brink of the sea cliffs at Terano Kau, at the South end, where the last lava stream reached the sea. Close to these carved blocks are eighty or more stone-built houses, of very great age, and not now used. They are in capital preservation, and in one of them was found the beautifully-perfect bust, about 8 ft. high, and weighing about 4 tons, which was brought to England by the *Topaze*, and presented to the British Museum.

The papakoo, or cemetery, is a terrace or platform, generally by the sea, made of rolled sea stones carefully fitted together, and about 100 yards long. They are numerous. Another very singular sort of structure is the platform on which numerous images have been placed. They are built on the land sloping towards the sea, and the sea face is thus much more conspicuous than the other sides; they are built with large unhewn stones, fitted with great exactness. They are variable in size; but one fine one halfway between Winipoo and Otu-iti, has an external wall, 30 ft. broad by 100 paces long. On the platform thus supported are numerous images now prostrate, some low pillars, apparently used for sacrifice, and others for burning the bodies, as burnt bones were found near them. Similar platforms have been found in the islands to the north-westward, especially one buried under guano, on Maldon Island, and this again connects them with the analogous ruins in Peru.

We have been more diffuse on these topics than the nature of this book would require; but as it would seem that this interesting people are fast disappearing, some account of the most remarkable remains in the Pacific which have been constructed by their ancestors may not be inappropriate.

Admiral Beechey says that Easter Island, bearing W. by N., at first had the appearance of being divided into two, rather flat at the top, with rounded capes; the N.E. of which is distinguished by two hillocks. On a nearer approach, numerous small craters are observed rising above the low land; and near the N.E. extremity, one of considerable extent, with a deep chasm in its eastern side. None of them had for a long time been in action.

The island is of triangular shape; its length is exactly 9 miles from N.W. to S.E., 9⅔ miles from W.N.W. to E.S.E., and 13 miles from N.E. to S.W. The highest part is the N.E. peak, 1,968 ft. high, and in clear weather it may be seen at 50 or 55 miles distance. There are no trees on the island.

The soil is decomposed lava, of a reddish hue, thickly strewn over with black lava blocks. The coast is rocky, and there are only two or three sandy creeks in all its extent. The only landing on the North side is in one snug little cove. On the East and West sides the coast is low and much indented, so that landing may be effected on that side which is to leeward.

Water is not abundant; that in the wells is brackish, but at the bottom of the craters it is to be had in abundance.

Cook's Bay, or Hanga-roa, on the western side of the island, is the chief anchorage, and around it most of the people reside: two-thirds of the population live in the village of Mataveri, about 1½ mile southward of the bay. *La Pérouse Point*, according to Admiral Beechey, is in lat. 27° 8′ 46″ S., long. 109° 24′ 36″ W.; by the Chilian survey of 1870, the former mission station at Cook's Bay is in lat. 27° 10′ S., long. 109° 26′ W. The bay affords good anchorage from October to April, the season of the trades; in other months it is often a lee shore, but from the trend of the land a moderately-formed ship could always get away, should it be necessary to put to sea. It is not recommended to vessels to anchor inside the depth of 16 fathoms, as then the ground becomes hard, and farther in there are large boulders. About a mile to the South of the bay is a cove called *Hanga-Piko*, where boats can land during the trade-winds.

On the N.E. side of the island is *La Pérouse Road*, and at a mile westward of it is *Anakena Cove*, a good landing place. On the South side of the island, eastward of Terano Kau, is the village of *Vai-hou*, where there was formerly a mission station.

Terano Kau, an extinct volcano, rises above the S.W. point to a height of 1,338 ft. Its crater sinks down to a depth of 700 ft., the bottom being a perfect circle of 2½ miles in circumference, in which pools of water are scattered about. Off the South point lie two rocky islets, one nearest the point high and peaked, the other low and flattish.

Ounipu or *Winipoo*, on the West side, is the spot where tradition says that the first settlers arrived, and its position on the lee side indicates the season in which they came. *Terano Hau* is an extinct volcano, much smaller than Terano Kau, and its crater is quite dry. It furnished the red stone or tufa from which the crowns of the images were dug.

Otuiti, the "little hill," is at the East end of the island, and 684 ft. high. It is very similar to Terano Kau, but smaller. It stands isolated on a large plain, and from the grey lava, of which its sides are composed, all the images are made. Near Terano Kau is a large hill of obsidian (volcanic glass). All the hills are rounded, and the soil on their slopes is very fertile.

The S.E. portion of the Low Archipelago, which may be considered as commencing at Ducie Island next to the westward, is within our present limits of lat. 20° S., but will be described altogether in a succeeding chapter.

RAPA or Oparo, Rapa-iti or "Little Rapa," was discovered by Vancouver, December 22, 1791. At first it bore N.E. ½ N., and then appeared as three small islands, the easternmost much resembling a vessel under sail. They did not land, but saw nearly round it. They considered that anchorage might probably be found on both sides of its N.W. point. Its greatest extent, which is in a N. 18° W. and S. 18° E. direction, is about 6½ miles, and it may possibly be about 18 or 20 miles in circuit.

Its principal characteristic is a cluster of high craggy mountains, forming, in several places, most remarkable pinnacles, with perpendicular cliffs nearly from their summits to the sea. The natives, who appeared not to have seen Europeans before, resembled other of the great Polynesian nations. They were estimated to amount to above 1,500 at least, On the tops of six of the highest hills some native fortifications were observed.

Rapa suddenly acquired considerable importance, when in 1867 it was proposed to establish a line of steamers between Panama, New Zealand, and Australia, as it had the nearest available port for a coaling station between Panama and New Zealand, being as nearly as possible two-thirds of the distance between the two places. It had remained unnoticed and almost unvisited from the time of its discovery until the period above named, and it was chosen by the Steam-ship company as a coaling station, because it was considered to be outside the limits of the islands under the French influence. But in May, 1867, Capt. Quentin, in the French ship *Latouche-Treville*, called here, and purchased the sovereignty of the island from the king for a gallon of rum and some old clothes, and officially placed it under the French Protectorate. It is now a French possession.

It was but little known prior to this period, and its fine harbour was discovered through the repeated enquiries of Capt. Vine Hall. The people, about 1,500 in number, in 1791, had diminished to only about 100 in 1881. They are in appearance a fine, manly, well-made race, somewhat resembling the New Zealander. As previously mentioned, it is by tradition the island from whence Easter Island was peopled, and is still called Rapa-iti, Little Rapa, while Easter Island is called Great Rapa. The name Oparo seems to be a misnomer, as it is unknown on the island, where it is usually pronounced "Lappa." The following is chiefly from Captain Vine Hall's account of it, given to the Royal Geographical Society in June, 1869, as derived from his visit to it in the steam ship *Ruahine*.

The island is of very irregular form, with several indentations in the coast, two of which are considerable bays, having each its little village, whilst the third and largest is the harbour, Ahurei. It is about 20 miles round, though from the irregularity of its outline it is difficult to estimate this exactly. The coast is bold, with no outlying reefs beyond half a mile.

The appearance of the island is very picturesque, with its sharp peaks thrust up as it were into the air, through the irregular but more rounded forms of the mountainous hills of the island. The height of these remarkable *Aiguilles*, or needle-shaped peaks, had been the subject of such different guesses, varying from 400 to 1,400 ft., that Capt. V. Hall ascertained by triangulation, &c., the height of the most remarkable peak in sight from the harbour to be 2,100 ft.

Ahurei Harbour, on the eastern side of the island, is a very snug and most romantic place; the land rising on three sides like the wall of an amphitheatre, and protected by the reefs and a beacon islet on the fourth or eastern side, with

the advantage of having fresh air from the open sea. Near the anchorage was a very small village, rejoicing in 31 inhabitants, but farther off, on the opposite side, was a large village, called the capital, where the king and the French resident live. The exit is inconvenient, by reason of the easterly winds; these are the prevailing winds, and the harbour lies nearly East and West. The roadstead is deep; the bottom coral, covered by a thin layer of mud. The squalls which descend from the mountains are very violent, and the anchors and chains exposed to constant beating and friction, are very liable to break. There is little danger of dragging, as the bay is well defended by the reefs at the entrance.

The entrance channel is tortuous through the projecting reefs, and therefore requires buoying; but when inside, there is room for twenty ships to moor safely. The tide rises 2 *feet* 6 *inches*, and it is high water, on full and change, at $12^h\ 15^m$. The entrance of Ahurei Harbour, according to Capt. Bellingshausen, is in lat. 27° 37′ 40″ S., long. 144° 15′ W., but French authorities make the longitude 144° 17′ 20″ W.

The peculiar irregular form of the land, with precipitous mountains and deep gullies, cause sudden gusts and eddies of wind in the harbour, varying continually in direction, so that it is difficult to say exactly what wind is blowing outside, unless it happens to be from the eastward, or directly in. It is said that there is a remarkable absence of surf, which is not easily accounted for, that landing is easy anywhere, and boats can lie alongside precipitous cliffs exposed to a swell which rolls in unchecked for thousands of miles without breaking.

The *climate* of the island is very delightful, for, surrounded as it is by sea, the temperature is very equable, and though close to the Tropic the thermometer seldom shows more than 75° in the height of summer. The weather, though mostly fine, is changeable, with occasional sudden showers, as might be expected from the effect of the high peaks arresting the clouds and causing them to precipitate their suspended moisture. The winds are for nearly nine months of the year from S.E. to N.E., and westerly the remaining part. Lying so near the Tropic, the trade wind is swayed southward by the sun in the summer time (November, December, January, and February), when the island is embraced by it, and left in the winter to the northern limit of the regular westerly current of air which then extends more northerly. Hurricanes are sometimes experienced.

The resources and products of the island are at present but few in number or quantity, excepting perhaps goats, which abound, and are to be seen everywhere delighting in the most inaccessible places, where, with a glass, their forms, moving to and fro on some razor-edged mountain, stand out in relief against the sky. Small vessels occasionally take a cargo of them to Tahiti.

The taro-root, the chief support of the inhabitants, grows abundantly, but requires attention to its culture, as it will not grow without plenty of water.

Coal of a very inferior quality has been found in the interior; the natives use it occasionally for cooking, &c., but it is useless for steam purposes.

There are curious remains of apparently fortified places at Rapa. On the summits of many of the steep hills are to be seen the square fortresses or terraces, some of very elaborate construction. But what is very singular, they are mostly solid within. The stones are well squared, of very large size, and well cemented. Around or on the top of one in the interior are still to be found the bones and skulls of a number of warriors, who, they say, were starved out by their opponents.

The so-called fortifications are evidently analogous to the "terraces," described on Easter Island; but there is no account of images being found on Rapa.

NIELSON REEF.—On January 19th, 1827, the ship *Sir George Osborne*, passed between two portions of this reef, on which the sea broke in places, being nearly level with the water. White coral was observed under the ship, from 4 to 6 fathoms; the reef extended a considerable distance, curving S.E. in the form of a crescent, as far as the eye could reach from the mast-head. The sea, being perfectly smooth, showed itself by breakers, only occasionally breaking. Its situation was lat. 27° 0′ S., long. 146° 16′ 45″ W. by chronometer. In 1831 the ship *Lancaster* struck on it; the weather was also fine, and the sea did not break. The least depth found was 12 ft. Besides the name of *Nielson Reef*, given to it after the captain, it is also called *Osborne Reef*, after his ship, and *Lancaster Reef*, after the second occurrence.

BASS ISLES.—To the E. by S. of Rapa are four small islands, discovered by Mr. Bass, well known as the gentleman who first passed through the strait separating Van Diemen's Land and Australia. They have been marked as the *Coronados*, or *Four Crowns*, discovered by Quiros, but there is nothing but their number to support this supposition. These last are identical with the Gloucester Isles, 7° farther North.

The Bass Islands were examined by the French ships *Lamothe-Piquet* and *D'Entrecasteaux*. They lie 46 miles to the E. by S. of Rapa, from which island they are visible in fine weather, and the S.E. rock, which is the highest of the group, is 346 ft. high, and is considered to be in lat. 27° 55′ 30″ S., long. 143° 28′ 20″ W.*

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* Several reefs and groups of islands have been announced as lying on a parallel to the southward of these islands; but as there is very little to support the assertion, it will be only necessary to mention them in this note.

A *group of islands*, in lat. 31° 6′ S., long. 127° 24′ W., from whaler report.

Mitchell Group, in lat. 31° 20′ S., long. 129° 30′ W.

An *island*, from whaler report, in lat. 31° 0′ S., long. 155° 0′ W.

A *reef*, announced in the San Francisco Herald, in lat. 30° 48′ S., long. 161° 17′ W.

An *island*, from various whalers' reports, between lats. 29° 34′ S. and 30° 10′ S., and longs.

TUBUAI, OR AUSTRAL ISLANDS.

This is a dispersed group, lying to the southward of the Society Islands and Low Archipelago. The first of these appellations is given to them in the charts by M. Vincendon-Dumoulin. The second is applied by Mr. Williams in his Missionary Enterprises. The islands composing the group have not been much frequented or visited, as they are small, and do not offer many inducements for the calls of passing navigators. They were visited by Lieut. P. G. Lebleux, of the French war vessel *Railleur*, in 1874, from whose report some of the following information is derived. Tubuai and Vavitao are now French possessions.

VAVITAO was discovered October 23rd, 1791, by Capt. Broughton, who placed it in lat. 23° 42′ S., long. 147° 11′ W. He did not apply any name to it, believing it to be the same as Tubuai.

M. Maurue gives the particulars of this island, which he calls *Hig* (*High?*) *Island*, in lat. 23° 40′, long. 148° 0′ W., the native name for it being *Ravaivai*. He says the people are very mild in their disposition. No provisions can be got. The current here is always so strong that it cannot be outrun in light breezes.

Capt. M. O'Neill, of the French transport *l'Orne*, 1874, gives the approximate position of Vavitao as lat. 23° 55′ S., long. 147° 48′ W. Lieut. Lebleux, of the *Railleur*, describes it as about 10 miles long E.N.E. and W.S.W., with high rugged summits. It is surrounded by a reef extending nearly a mile from the land, covered on its southern and eastern parts with wooded islets. An islet lies on the outer side of the western part, and about 2 miles eastward of it is the only passage to the anchorage; the passage is about a mile long, with 5 and 6½ fathoms water, but has several shallow coral heads in it. The *Railleur* reached the anchorage by keeping the V-shaped notch of a double-summit hill, on the western part of the island, open eastward of a conspicuous block of rock on the shore. Vessels can anchor at the entrance of the passage, but with northerly winds a heavy sea rolls in, when it would be unsafe.

At the western extremity of Vavitao is a large bay, with excellent anchorage in all winds, but only to be reached by steamers, two large coral patches lying between the reef and the island. No water can be obtained, there being only a few springs used by the natives, who numbered about 350 in 1881.

TUBUAI is the next island to the westward, and is much smaller than

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143° 0′ W. to 144° 24′ W., may refer to Bass Islands, or it is barely possible, though not probable, that another island may exist at one of the points named.

A *shoal*, from whaler report, lies in lat. 35° 0′ S., long. 155° 0′ W. It may be the same as the above.

Vavitao, being not more than 5 miles in extent. On making it from the northward it appears like two islands, but the two hills join at the base. A reef surrounds the island at a distance of about a mile from the shore; on the N.E. part of the reef are several islets, and on the N.W. part is a large opening which forms the passage leading inside the reefs. The notch between two elevated peaks on the western part of the island, kept bearing South, leads to the anchorage, which is at the entrance of the passage leading inside the reefs. This anchorage is, in bad weather, safe only with winds from South to E.N.E. The harbour inside the reefs is unsafe, fit only for small vessels, and the anchorage outside is insecure and rocky, with bad holding ground.

The French flagstaff is on the North side of the island, about the middle, and is placed by M. Delamarche in lat. 23° 21′ 45″ S., long. 149° 35′ 35″ W. The anchorage is with the flagstaff bearing S. ¼ E., *true*, about 1¼ mile distant, and is very bad, coral bottom, so that if you drive you will lose your anchors. There are pilots—it would be imprudent to enter without one. There is a Protestant church built on piles in the principal village, a little eastward of the passage, near which excellent water is to be procured. The population is small, and decreasing, amounting to 343 in 1881; in 1878 the port was opened to foreign trade.

RURUTU, or Oheteroah, discovered by Captain Cook in his first voyage, August 14, 1769, is rather high than low, but neither populous nor fertile in proportion to the other islands he had seen. M. Maurue calls it *Rouroutoua*, and says there are some harbours for small ships, the population numerous and inoffensive. Rurutu, says Capt. Bruce, is about 1,300 ft. high, volcanic in appearance, having two small peaks, and higher in the centre, with uneven outline, and is 3 or 4 miles from East to West, with a bold appearance. Captain Bradley, R.N., in 1869, says that it is 7 miles long; the South extreme showed as a shelving point, with breakers running off it, while the northern side runs off it in several low points to the westward. The South end was made to be in lat. 22° 31′ S., the North end 22° 24′ 30″ S., the longitude of the eastern point 151° 18′ W. This generally agrees with Captain Bruce's determination, lat. 22° 29′ S., long. 151° 20′ 25″ W., which was found to be correct by Commodore Powell, R.N., in the *Topaze*, 1867.*

Capt. Hamon, of the schooner *Young*, of Tahiti, says there are three villages on the island; and a narrow passage through the reef at the N.E. end, where vessels of 40 to 50 tons can enter. The passage at the S.E. end is only fit for boats, and that in fine weather. The natives export 20 tons of cotton, 5 tons of cocoa-nut oil, 2 tons of sponge, and 15 to 20 tons of arrowroot. The inhabitants are Protestant, under the direction of the London Missionary Society.

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* Capt. Moses, of the barque *Henry*, reports the loss of that vessel on a coral reef, in lat. 22° 47′ S., long. 151° 7′ W., over which there was only 11 ft. water. Traders do not believe it to exist.

The island is wooded in parts, and can supply pigs, fowls, and water, as well as vegetables and fruit in limited quantities. The natives, who number about 500, have great taste and skill in producing certain cloth, in carving, &c.

Lieut. Lebleux says that the island is about 5 miles long North and South, the reef which surrounds it being nearly contiguous to the shore. On the N.E. part of the island is said to be a small port, fit only for native small craft. Near the middle of the western side is a bay 2 miles deep, which is safe and convenient for anchorage; the bottom is first seen at about 5 cables from the surrounding reef.

RIMITERA was discovered by Capt. Henry. It is highest in the centre, which is about 300 ft., being, according to M. Maurue, rather lower than its neighbours. It has no harbour, but has the same provisions, which he procured at a very easy rate.

Capt. Bruce, R.N., says:—Passing Rimitera at 9 or 10 miles distance, it appears low at the extremes, gradually rising in the centre to a height of 300 ft. at least, and is 2 or 3 miles from point to point, with a coral foundation, but a dark appearance over it. Its position was ascertained as lat. 22° 40′ S., long. 152° 59′ 49″ W., but the French place it in lat. 22° 45′ S., long. 152° 55′ W.

Capt. Hamon, of the schooner *Young*, of Tahiti, says that the natives build boats of from 20 to 50 tons, and export from 15 to 20 tons of cotton. They produce cocoa-nut oil, rear pigs and fowls, and cultivate vegetables and fruit. There is no passage through the reef, which is close to the shore, but the village on the East, as well as that on the West side, is equally accessible, not so the village at the South end.

HULL, MARIA, or SANDS ISLANDS, a group of four small islands, were first reported by Mr. J. R. Sands, of the *Benjamin Tucker* whaler, October 19th, 1845, in lat. 21° 50′ S., long. 154° 0′ W., and appeared 30 ft. high. Since that time Hull Island, 28 miles to the westward, and a small island about a degree to the westward, have been reported, and no doubt represent the same group as Sands Islands. These islands were thoroughly examined by Lieut. Lebleux, in the French ship *Railleur*, in 1860, who found the reef triangular in form, with its longest side lying N.W. and S.E., along which three islands were placed in a distance of about 3 miles, a fourth island lying at the apex of the triangle, 2 miles N.E. of the centre one, the highest rising 66 ft. above the sea. The position of the N.W. corner he placed in lat. 21° 49′ S., long. 154° 51′ W. Landing was impracticable, owing to the surf.

COOK'S ISLANDS.

This group of islands, which lie scattered over a considerable space, without any intimate connection between each other, were so collectively designated by Admiral Krusenstern, in the first volume of his invaluable Memoires Hydrographiques. It consists of nine or ten separate islands, the greater part of which were discovered by Cook; hence the appropriateness of their collective appellation. The progress of Christianity in them occupies a considerable portion of the interesting Missionary Enterprises, by the late Rev. John Williams, who, with some other authors, called them the *Hervey Isles*, the name of one of the groups.

We derive some of the subsequent particulars from imperfect data on the Archipelago, given by Lieut. Alex. Quentin, commanding the French vessel *Latouche-Treville*, in May, 1864; H.M.S. *Cameleon* was also here in 1872, and some later descriptions are given by Karl H. A. Mainwaring, R.N., her commander.

In 1864, the population of the Archipelago was estimated at about 7,000. There are permanently about 400 or 500 people who go over to Tahiti as labourers, where they remain two or three years, and return to their homes with some money, and with habits of order and civilization.

MANGAIA or *Mangea*, the south-easternmost of the group, was discovered by Capt. Cook, March 30th, 1777, in his third voyage. He places it in lat. 21° 57′ S., long. 158° 7′ W. Lieut. Quentin gives it as lat. 21° 49′ S., long. 157° 56′ W.

It is of volcanic origin, not more than 700 ft. high, and is about 30 miles in circumference. At a distance it appears flat. The coast is not defended, as usual, by a reef, the sea beating direct upon its flanks; but a mass of coral attached to it, and not extending more than 15 or 20 yards out, serves as a breakwater and shelter to it. There is not any opening; it consequently has neither port nor road. The sea around it is of great depth, and without any danger. The only communication with the land is made by means of canoes, which alone are capable of clearing the narrow line of heavy surf separating the shore from the ocean, which is done at high water, and seizing the most favourable instant.

The principal village, *Oneroa*, lies on the West side of the island; and it is to this part that ships desiring to trade with the natives ought to come. With the usual winds it is preferable to make it to the South, for the currents bear to the North.

Mangaia is governed by a king and five chiefs, assisted by sub-chiefs of districts. There are three villages, each of which has a church and school, but the only Mission Station is at Oneroa, on the West side, where there is landing. The island is healthy. The number of births and deaths, in 1872,

were nearly equal. The chief exports are cotton, coffee, arrowroot, and cocoa-nut oil. Pigs, turkeys, fowls, ducks, yams, sweet potatoes, and pine-apples are also produced. The natives are spoken of as industrious, intelligent, and fair dealing people. About a dozen schooners visit the island during the year, principally from Tahiti and Rarotonga. It is necessary to go 3 miles inland to procure water.

In 1848 the population was considered to be about 4,000; in 1864 it was 1,200 to 1,500, and in 1872 it was estimated at 2,000.

RAROTONGA is a beatiful island seen in the *Seringapatam*, in 1814; Mr. Williams, the missionary, says that he discovered it in 1823. It was also seen by Capt. Dibbs, in the schooner *Endeavour*. It is a mass of mountains, which are about 2,900 ft. high, and present a remarkable romantic appearance. It has several good boat harbours, but no anchorage; it is about 30 miles in circumference, and surrounded by a reef.

This island appears to be of the same formation as Mangaia. Like it, it may be seen at a great distance, and only differs in that the surrounding reef is not quite continuous, but has in some points small openings, which afford harbours for small vessels, without shelter, and anchorage without holding ground.

The principal village, named *Avarua*, is in the North. The entrance to it, which affords communication with the sea, may be about 50 yards broad within the reef, where schooners of 100 tons can enter and moor to the reef on either side. Another, named *Atauia*, is in the S.E.; *Ngatangia* on the East; and the last, *Arognani*, in the N.W. Atauia, the most important after Avarua, is a bad harbour; and the recent loss of some coasting vessels offers little encouragement for others to follow them. That of Aragnani is in still greater discredit.

The productions of this island, which is much more fertile than Mangaia, are exactly the same; and although frequent communication and the ties of relationship unite the inhabitants of these two islands, they but little resemble each other in respect of industry and intelligence.

The brother of Mr. Gill, of Mangaia, exercised the same functions at Rarotonga, but stated with regret that he had not obtained the same good results. In 1864 the population was estimated at 2,500 men, divided into five districts, which seemed independent of each other, but Avarua was the chief. Some European traders are settled here. The anchorage off Avarua, on the N.W. side, is perfectly sheltered from southerly winds, but is very dangerous with northerly ones. Large vessels standing off and on should be careful not to get too close in-shore, especially on the West side of the settlement, as there is a considerable set on-shore, and several ships have been wrecked, there being deep water and no anchorage close to the edge of the barrier reef. A steamer could almost stop here. The bearings are easy; bring a peak in one with a wooded hill on the shore, bearing *S.* 21° *E.*, *true*, and then pass the line of

breakers in an easterly direction, and anchor in 13 or 14 fathoms, at 5 or 6 cables off shore. The depth diminishes rapidly, and so there is some chance of driving. At the bottom of the bay is a brook where water is got easily.

"South Sea Island cotton is grown, about 250 acres of land with that plant being under cultivation. A ginning machine is erected near the settlement, where the cotton from the Hervey group is sent previous to its being shipped off either to New Zealand or Tahiti. Coffee of a good quality is also grown and forms one of the chief exports. A Queen is the Sovereign, and the form of government is the same as at Mangaia. The natives number 2,000.

"The Rev. Mr. Chalmers (L.M.S.) has an institution at Avarua for the education of native missionaries, many of whom have been sent to the outlying stations at Humphrey (Manihiki), Reirson (Rakaanga), and Danger (Puka-Puka) Islands, lying to the northward of this group."—H.M.S. *Cameleon*, 1872.

The position of the N.W. point is in lat. 21° 11′ 35″ S., long. 159° 47′ W. Capt. Powles, of the ship *John O'Gaunt*, 1882, made the centre of the island, by good observations, to be in lat. 21° 14′ S., long. 159° 48′ W. It is the same as the *Roxburgh Island* of Capt. White, and the *Armstrong Island* of Reynolds.

Ruruti.—Nothing is known of this island, and its existence is even very doubtful. Capt. D. Bethune, of H.M.S. *Conway*, in 1837, speaks of it on hearsay, as 50 or 60 miles N. by E. (nearly) from Rarotonga. From the English Admiralty chart it is omitted; on the French charts it is placed N. by W. from Rarotonga. Capt. Bethune gives the *position*, lat. 20° 20′ S. long. 160° W.; Lieut. Quentin gives lat. 20° 19′ S., long. 160° 2′ W., and no further particulars beyond its being uninhabited. If it is the *Oruruti* of Capt. Henry in 1811, he placed it a degree further South than Capt. Bethune and Lieut. Quentin, in which case it would be Rarotonga, already described.*

VATIU, Atiu, the *Wateeo* of Cook, who discovered it March 31st, 1777, is about 8 miles long. The chief's house may be seen afar off, and near to it is a church, built in 1864 by the native missionary, Abrahama. The South end of the island is in lat. 20° 4′ S., long. 158° 8′ W. Cook describes his friendly reception by the natives at great length.

Mr. Williams describes the island as larger than Mauki or Mitiero, and about 20 miles in circumference. The highest point is about 380 ft. above

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* "That islands do occasionally disappear entirely in these parts there can be little doubt. The Tahitian schooners were formerly in the habit of trading with a small island close to Rarotonga, whose name I forget; but about four years ago, when proceeding thither with the usual three-monthly cargo of provisions, &c., they failed to find the island, of which no trace has since been seen. Two missionaries are believed to have been on it at the time of its disappearance, and to have shared its mysterious fate."—See "A Voyage in the Sunbeam," by Lady A. Brassey, 1878, p. 246.

the sea, and may be seen 25 miles off. There are three villages on the island, and the population numbers about 1,200 or 1,400. The missionary is a Protestant native. The island produces 10 tons of cocoa-nut oil, a ton of cotton, a ton of arrowroot, and 3 tons of sponge, and other produce like the rest of the group. Storms from between S.S.E. and N.N.W. by the South and West sometimes occur in February and March.

There is but little navigation; their canoes are too small, and the reef must be crossed. The North side is the best to make. Small vessels can anchor in 16 fathoms, on a small patch on the edge of the reef. They are sheltered from the South, but should not, if possible, pass the night here, in case a North wind should set in.

Takutea is the *Wenooaette* (*i.e.*, Wenua-iti, Little Island) of Cook, who discovered it. It is in lat. 19° 51′ S., long. 158° 16′ W. about 13 miles from Atiu, the inhabitants of which called it *Otakootaia*, and sometimes *Fenua-iti*, or Little Island. It is not more than 3 miles in circuit; the beach without the reef is composed of white corals, above which the land does not rise higher than 6 or 7 ft., on which grow several clusters of cocoa palms and vast numbers of other trees. It is entirely destitute of water. It was then uninhabited, but some empty huts, &c., were seen.

Mitiero, according to the account given by Capt. Dibbs, of the *Endeavour*, lies in lat. 20° 1′ S., long. 157° 34′ W., at the distance of 30 miles from Atiu; another authority places it in lat. 19° 49′ S. It is a low island, having a large clump of trees in its centre; it is from 3 to 4 (Lieut. Quentin says 8) miles from North to South, and a mile from East to West. Mr. Williams states, that from famine and invasion the population did not exceed 100 persons; in 1864 it was estimated at 300 or 400. It produces about 2 tons of cocoa-nut oil. Atiu, Tokutea, and Mitiéro (or *Mattiaro*), are connected together socially; the rest of the group are independent.

Mauki, or *Parry Island*, is also a low island. It is about 2 miles in diameter, well wooded, and inhabited; but the soil does not appear in any part to exceed 40 ft. above the sea level. It is situated in lat. 20° 7′ S., long. 157° 11′ W. The S.E. extreme of the island was ascertained by sea observations, taken from H.M.S. *Alert*, 1880, to be situated in lat. 20° 15′ S., long. 157° 18′ W. Mauki is reported to have no anchorage near it, but canoes come off in fine weather to communicate with passing ships.

In Arrowsmith's chart the island is termed *Parry Island*, as laid down by Lord Byron in 1825, who calls it *Mauti*. At the time of this visit the natives were exceedingly friendly, and were civilized by the missionaries. Cocoa-nut, pandanus, and bread-fruit grew on it. Mr. Williams says, that prior to 1820 the population was considerable, but in that year an invasion and terrible massacre reduced the population to 300, since which it has increased but little.

A small quantity of cocoa-nut oil is produced, but no cotton. Other productions are the same as at Mangaia. Whalers often call here and procure men.

HERVEY ISLANDS were discovered by Cook in his second voyage, in 1773, and also seen by him in his third voyage, in 1777. They were named by him after Capt. Hervey, afterwards Earl of Bristol, one of the Lords of the Admiralty. This name has sometimes been extended to the whole group. Cook says that they consist of three islands, surrounded by a reef, which may be 18 miles in circumference. The inhabitants call two of them, perhaps the largest, *Manuai* and *Auotu* (Bethune) or *Uitate.* These two islands, Lieut. Quentin says, lie 5 or 6 miles N.E. to S.W. from each other. In 1870 the population did not exceed ten in number, and an export of five tons of cocoa-nut oil was reported. Mr. Williams says that there is no entrance into the reef, and that the desolating wars among themselves had reduced their number to a dozen people in 1830. Lat. 19° 18′ S., long. 158° 54′ W.

AITUTAKI (or *Whytootaké*) is the northernmost of this group. It was discovered, April 11, 1798, by Capt. Bligh, in the *Bounty*, a few days before the mutiny. When he made it to the S.S.W., 15 miles distant, it appeared of moderate height, with a round hill on the North part; the N.W. part was highest and steep; the S.E. sloped off to a low point. It has a most fruitful appearance, its shores being bordered by flat land, on which grow innumerable cocoa-nut and other trees, and the higher grounds beautifully interspersed with lawns. Capt. Bligh says it is 10 miles, Williams says 18 miles, in circuit. Bligh's observations placed it between lats. 18° 50′ and 18° 54′ S., long. 159° 41′.

" This island is low, except at its N.E. side, where it rises to a hill about 450 ft. high; a reef extends to the S.W. for 7 or 8 miles, and should be approached with caution. The mission settlement of Arutanga is on the N.W. side. There is a break in the barrier reef off the settlement, where boats can enter, but no anchorage for trading vessels; they can, however, approach the reef, as there is always an off-set. *Hurricanes* occur about once every seven years, but these storms are very local; the worst months are from December to March inclusive. Commencing at N.W. to North, ending at S.E., they do immense damage.

" The government consists of three chiefs and a number of sub-chiefs. The population by the census of 1872 was 1,550; the births are far in excess of the deaths. Cook Islands seldom suffer from the effects of epidemics, and are generally healthy. Their houses are built of coral, whitewashed, with thatched roofs, and present a very picturesque appearance from the sea."—H.M.S. *Cameleon*, 1872.

The cultivation of oil has lately commenced, and cocoa-nut oil is exported. On the western side of the island the chapel and school-house are large and conspicuous. The channel through the reef, marked by a beacon, is a mile long, and very narrow, with from 6 to 10 ft. water in it. A jetty is con-

structed at the head of this channel, from which there is a supply of water. American whaling ships are annual visitors, calling for wood, water, and general supplies.

The reef commences at a rocky point terminating the beach, at the S.W. end of the island, and extends in a S.W. by S. direction, connecting the island with another small one, covered with trees, distant 5 miles from the South point of the principal one; and from this small island the reef continues nearly due East for 8 miles, enclosing a group of seven or eight small islands, all thickly wooded.

The highest cone on the North side of Aitutaki was determined by sea observations from H.M.S. *Alert*, to be in lat. 18° 51½′ S., long. 159° 49′ W.

Besides the above, which it is believed constitute the whole of the group, Cook mentions another, which he calls *Mahowarah*, which is probably Mitiaro or Mauki.

PALMERSTON ISLAND, discovered by Cook in his second voyage, is a group of small islets, nine or ten in number, lying in a circular form, and connected by a coral reef. They are covered with trees, but no water was found. The N.E. portion of the group was submerged by the effects of a hurricane in 1865, and is now dangerous, several wrecks having occurred. By the observations made in the French corvette *Bucephale*, October, 1843, the West Islet is in lat. 18° 5′ 50″ S., long. 163° 10′ W.; and the N.E. Islet in lat. 18° 1′ 10″, long. 163° 6′, results very nearly coinciding with those of Cook.*

Haymet Rocks were discovered by Capt. Haymet, of the cutter *Will Watch*, in 1863. He passed between two rocks about a quarter of a mile distant from each other, with apparently but 7 or 8 ft. water over them, and struck on the northern one. Lat. 27° 11′ S., long. 160° 13′ W.

L'Orne Bank.—On September 11th, 1874, the French transport *l' Orne* passed over a bank upon which a depth of 16 fathoms, rock and sand, was found; the approximate position of which is lat. 27° 42′ S., long. 157° 44′ W. In 1877 a

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* New Island.—According to M. Dutaillis, this island, which from private interests would remain unknown, lies, it is said, in lat. 24° 20′ S., and long. 159° 30′ W. In addition to the position above given, Commander Hamond, H.M.S. *Salamander*, states that an island exists in lat. 24° 0′ S., long. 159° 10′ W. This must be the same, if such an island exists, which is very doubtful, and totally disbelieved in by South Sea traders.

Tuanahae (?) is also an island announced as doubtful by Commander Hamond, in lat. 26° 30′ S., long. 160° 25′ W. It is called *Tuanaka* by Capt. Gray, United States' Consul at Tahiti, and placed by him in lat. 25° 50′ S., long. 160° 55′ W.

Drotoi Island, a whaler report, in lat. 27° 17′ S., long. 159° 40′ W., is in this vicinity, so that there may be an island hereabouts; but Capt. Harvey, R.N., in H.M.S. *Havannah*, could not find them in the assigned positions.

depth of 5 fathoms was reported on this bank by Capt. Chambeyron, of the French war vessel *le Curieux*.

Maria Theresa Reef, discovered in 1843, lies in about lat. 35° 20′ (or 37° 0′) S., long. 151° 0′ W. Recent investigation goes to show that it is in lat. 37° S., long. 151° 13′ W.

Capt. Ringe, German barque *Jupiter*, reports having passed breakers during the night of December 3rd, 1878, in lat. 36° 37′ S., long. 150° 15′ W.; they were observed in two places, each of which had a diameter of about 30 yards, and appeared to be a quarter of a mile apart.

Beveridge Reef, a very dangerous shoal, first announced in the Nautical Magazine, August, 1833, p. 442. It is also the same reef called *King George Reef*, *Middleton Reef*, and *Nicholson Shoal*. It is nearly certain that all these reports refer to the same danger, as the routes of several vessels along and near the parallel of 20°, including the French vessels *Provencale* in 1859, and *Mégère* in 1870, sufficiently show there is not a second.

According to the original notice, no part of it appears above water, but the sea breaks over it in many places. On the inside of the reef there appeared to be deep water. Its extent is about 10 miles North and South, and about 8 miles East and West. On the West side, near the S.W. point, there appeared to be an opening. The position first assigned agrees exactly with that obtained by Sir Edward Belcher. By this latter it is called *Lagoon Reef*, and his account is as follows :—"By our survey it appears that this reef occupies an outline similar to that of a coral island, having an entrance to the N.W. All the mass of shoal water appeared to be contracted at its S.W. extremity, but no rocks above water could be traced. The S.W. extremity was determined to be in lat. 20° 2′ S., long. 167° 49′ W., which differs from that assigned to the shoal seen by Capt. Nicholson. We termed it Lagoon Reef."

But some portion of it would appear to have become an island, as Mr. Edward Howard, of the American barque *Hermione* (1855), discovered a coral *island* in the exact position, in length 3 miles, width about 2¼ miles.*

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* Doubtful Reefs.—On June 26th, 1842, the ship *Thomas Dickenson*, Capt. Harans, passed a low reef, apparently level with the sea, about two ships' lengths in extent, N.E. and S.W.; being dusk, could not determine exactly. Lat. 21° 32′ S., long 168° 54′ 30″ W. A *reef*, announced by the "San Francisco Herald," as in 21° 42′ S., long. 167° 45′ W., may be the same. Another report by a whaler places a reef in 21° 40′ S., long. 167° 45′ W.

Thompson or *Acis Reef* is reported to lie about 200 miles E.S.E. of Tonga-tabu. Capt. Thompson, of the *Acis*, stated that he saw the sea breaking heavily on it, and that it extended N.E. and S.W. about 3 miles. From good observations it was placed in lat. 22° 47′ S., long. 171° 48′ 30″ (1854). H.M.S. *Alert*, 1880, made a thorough search of this neighbourhood, lasting 12 days, but found no trace of the reef. It has been expunged from the Admiralty charts.

Buffon Reef.—In 1880 it was stated that the French barque *Buffon* narrowly escaped shipwreck on a breaking reef, supposed to lie in lat. 20° 39′ S., long. 169° 58′ W., or about 90 miles South of Savage Island.

TONGA OR FRIENDLY ISLANDS.

The merit of the discovery of these islands is due to Tasman, who first saw them, January 29th, 1643. He anchored on the N.W. side of Tonga-tabu, to which he gave the name of Amsterdam, as he imposed those of Middelburg and Rotterdam to Eooa and Namuka. The recollection of his friendly relations with the natives still remained when Cook visited it during his third voyage, in 1777, when he stayed three months here (April to July). Cook was the second navigator who saw them, in October, 1773, during his second voyage. In his third voyage, above alluded to, he stayed more particularly at Tonga-tabu, where he remained for thirty-six days, and maintained the most amicable relations with the inhabitants, which caused him to attach to them the appellation by which they were known; but we learn from the narrative of Mariner, and also from other sources, that these apparently friendly people, with Finow at their head, had planned an assault on the two ships, and a massacre of the whole crew; but the plot failed, from a misunderstanding of one of the chiefs. This people, also, we are told by D'Urville, had the same intentions towards D'Entrecasteaux and his ships.

In February and March, 1781, the Spanish navigator, Maurelle, discovered Vavu and several of the neighbouring islands. In the last days of 1787, La Pérouse saw these islands. In the year following, Lieut. Bligh passed three days at Namuka; two days after which the mutiny of the *Bounty* took place. In 1791 Capt. Edwards, in the *Pandora*, made two visits to these islands. In 1795 an American vessel left six deserters here, *not* for the benefit of the natives.

It is to the excellent work drawn up from the recital of William Mariner, by Dr. John Martin, that we owe the most complete knowledge we possess of the Tonga Islands. On the 22nd of November, 1806, the English privateer, *Port-au-Prince*, carrying 96 men, anchored before Lefuka, one of the Hapaï Isles. On the morrow the ship was seized by the natives, and of the 62 men that then formed her crew, the captain and 36 of his companions were massacred. Of the 26 who were spared Mariner was of the number, and the chief, Finow, being much interested in the young man, took him into his own service. He was taken off by the brig *Favourite* at the end of 1810, with the deep regrets of the people who had been so kind to him; during his residence of nearly four years among them, he observed the customs and manners of the natives, and from observations gathered during his stay, the narrative alluded to was drawn up.

The London Mission attempted the conversion of these islands as far back

as 1797, but was compelled by the war to abandon its project; in 1822, the first Wesleyan missionary landed at Tonga-tabu, but, owing to a variety of circumstances, the mission was not fully established till 1826. There are no longer any avowed heathens; all the natives have embraced Christianity, the greater part of them as Wesleyans, the remainder, about 1,200, as Roman Catholics. Primary instruction is so extensively diffused that nearly everybody knows how to read. English is tolerably well understood, but little spoken, in consequence of the difficulty presented by the pronunciation of the consonants.—*Brenchley*, 1865.

Although in West longitude, the same day of the week is observed at the Friendly Islands and Samoa as in Australia—the principal trade being carried on with the Australian colonies.—H.M.S. *Sappho*, 1877.

The Tonga Archipelago is composed of at least one hundred islands and islets, comprised between 18° and 22° S. latitude, and 174° and 176° W. longitude. The three islands of Tonga-tabu, Vavu, and Eooa, are alone of any extent, Tonga-tabu, the largest, being about 20 miles in length. Seven others, namely, Lettè, Tofoa, Kao, Namuka, Lifuka, Eoa, and Haano, are from 5 to 7 miles in their greatest extent. The rest are much smaller. Many of them are only banks of sand or coral, covered with some tufts of trees. Tofoa, Kao, Lettè, and the two rocks of Honga Hapaï and Honga Tonga, are sufficiently high to be distinguished at 45 to 60 miles off at sea. Eooa, Namuka, and Vavu are of a moderate height. Tonga-tabu, and all the rest, are very low.

The population of the Tonga Islands, as given by the missionaries in 1839, was 18,500; namely, Eooa, 200; Hapaï, 4,000; Vavu, 4,000; Keppel's Island, 1,000; Boscawen Island, 1,300; Tonga-tabu, 8,000. In 1865, the population of Tonga-tabu Island was about 9,000, including the population of the small surrounding islands, Eooa 500, Eua Iki 100, and Atata, 100. At this time there were 54 whites on the island. In 1876, the total population was estimated to amount to about 30,000.

The states of King George, whose royal title is Tuikanakubulu, comprise the three groups of Tonga, Hapaï, and Vavu, and formerly three islands of the Fiji group, Moala, Matuka, and Vanua Lava. The king's residence was at Tonga-tabu, in 1865, when H.M.S. *Curaçoa* was here. In 1849 his residence was at Lifuka; the king was then a fine man about 48 years of age. He is reported to have been of a warlike character in his younger days. The government may be called a limited monarchy, the chiefs meeting for debates. This mode of government was adopted in 1862.

In September, 1876, the German government concluded a treaty with King George, whereby they are allowed to form a coaling and naval station at the islands.

The *Climate* of Tonga is humid, and the heat oppressive, rising frequently to 90° in the shade; much rain falls. The trade winds are by no means constant, and westerly winds occasionally blow in every season, which, from

their variable character, have obtained the name with the natives of "foolish winds." The climate cannot be considered salubrious; very heavy dews fall at night, and no constitution can endure frequent exposure at this time; the transitions from heat to cold are sudden and great, and the nights are often so chilly as to make blankets necessary.

Hurricanes are frequent in this group, scarcely a season passing without some occurrence of this kind; the months of February and March are those in which they occur; but they have also taken place in November and December. The storms begin at the N.W., thence veer to the eastward, and end at S.E. In these storms the wind is frequently observed to change almost immediately from one point to its opposite; and in the same group of islands trees have fallen, during the same gale, some to the South, others to the North. They are local in their effects, and fall chiefly upon Hapaï and Vavu; if the fury of the storm be felt at Vavu, Tonga generally escapes, and *vice versâ*; but Hapaï is more or less the sufferer in both cases, situated as it is between the two places. These phenomena, which are those well known as attendant on *revolving* cyclones or storms, will be readily explained by their means.

Winds from S.E. and E.S.E. prevail in the vicinity of Tonga-tabu, but in the months of February, March, and April, they frequently blow from West and N.W., and often for several days together, accompanied by showers of rain and violent gusts. The very heavy swell from S.W., raised by the gales in high South latitudes, is almost continual, and keeps up a very strong surf on the southern coast of that island. The current has been found setting to the westward between the groups of islands.

Earthquakes are rather frequent at the Tonga Isles; for the first missionaries, in 1797, felt two or three shocks in the space of three months only. Without doubt these convulsions are connected with the eruptions of *Tofoa*, which is a volcano in continual activity.

Mosquitoes are exceedingly troublesome at times. Sometimes a crew will be almost overpowered by their intolerable annoyances, and the ship so filled with them, that she may be (not inaptly) likened to a "musical box."

TONGA-TABU GROUP.

This is the principal and southernmost group, taking its name from the best known and largest of the islands.

EOOA, or *Eua*, lies about 10 miles to the S.E. of Tonga-tabu; Tasman called it *Middelburg*. Cook saw it at 36 miles distance; and the place where he anchored, on the N.W. part of the island, he called *English Road*, in lat. 21° 20′ 30″ S. The island is about 30 miles in circuit, and 600 ft. high. It is rocky and barren, and contains only about 200 inhabitants.

Catto, lat. 21° 30′, long. 175° 1′, is 2 miles off the S.W. end of Eua. Cook passed between them.

TONGA-TABU, 20 miles in length East and West, and 8 miles in width, is of the form of an irregular crescent, whose convexity faces the South, and the concavity the North, deeply indented by a lagoon of 5 miles broad, and 3 miles deep. Immense reefs of coral extend 6 or 8 miles off the island on all its North part, and form different channels, with a useful road for any ship that anchors here. Many islets are disseminated on these corals, the greater part covered with trees. One of them, *Eoa-Tehi* (Eouaigee or Eooajii), is placed on an isolated reef, and has a surface of 3 miles in circuit. All the rest of the littoral of Tonga-tabu, from its eastern point round South to the western, is of a totally different aspect, and the belt of coral surrounding it rarely extends more than a cable's length off.

The island itself is nearly a dead level, with the exception of a few hillocks 30 or 40 ft. high. Its highest point is 60 ft., on which is the fortress of Niukalofa, the scene of many of the exploits which Mariner relates, and on it now stands a Christian church, a striking object from the anchorage. The view from it is extensive, over the island on one hand, and over the coral reefs and the deep ocean on the other. Near the church door is the tomb of Capt. Croker, of H.M.S. *Favorite*, who was killed June 21, 1840, in the assault on the fortress of Bea. The tombs of two missionaries, who were massacred by the natives, are also to be seen some yards below the fortifications of Bea, 5 miles from Niukalofa.

D'Urville says that everywhere the soil of Tonga-tabu is of prodigious fertility, whether for natural productions or for those cultivated by man. The missionaries found that it consisted of a rich soil, 15 inches deep, free from stones, beneath which is a reddish earth, 4 or 5 inches deep, and then a blueish clay, more compact. In some parts there is a blackish mould, exhaling an agreeable odour of bergamot, which quickly evaporates in the air. This extent of vegetable mould, which distinguishes it from other coral islands, giving a different character to its vegetation, which, in luxuriance of foliage, is not to be surpassed. Some pieces of pumice have been found on its shores, drifted there probably from the volcanic island of Tofoa.

Fresh water is rare upon the surface of the island, and it is doubted if there is a rivulet, properly so called; but, by digging to a trifling depth, brackish water is generally obtained. An excellent road, 20 ft. wide, extends from one end of the island to the other, sending out branches to each village.

The commercial products of Tonga-tabu, are cocoa-nut oil, about 100 tons, valued at £7,000; arrowroot, tapioca, cotton, and coffee, the latter in small quantities, although the island is admirably suited for both cotton and coffee. The principle articles in request by the natives are clothing, cotton prints, &c., for which they pay in silver or oil, yams, pork, and poultry. The demand for European goods is, however, not increasing. Of animals, the ox, horse, ass, sheep, pig, goat, dog, rat, and rabbit have been imported. Birds are numerous, including pigeons, ducks, fowls, turkeys, &c. Several European vegetables

are grown, besides bananas, yams, oranges, pine-apples, sugar-cane, sweet potatoes, &c.

The residence of King George, to whom the islands owe so much, is at *Niukalofa*, the principal town of the island, situated at the head of the harbour. The missionary station is built on the sea-shore, about a mile eastward of the King's palace, and surrounded by trees.

Tasman, when he discovered the islands, anchored in a bay in the western part of the island, which he called *Van Diemen Road;* a second bay was named by him *Maria Bay*. These two names, which are elsewhere applied, perpetuate the attachment he had for the daughter of the Dutch Governor of the East Indies. In 1773, Cook also anchored in the first of these bays, but he does not speak well of it; he found a safe road in the northern part of the island, formed to the S.E. by the coast of Tonga-tabu, and to the East and E.N.E. by two small islands *Panghai-motu* (Pangimadoo of Cook) and *Hoolaiva*.

This harbour is a well determined position. Cook stayed three months in the Friendly Islands, and referred all his chronometric measurements to this. D'Entrecasteaux established his observatory on Panghaï-motu. Cook referred his position to a tongue of land on the chief island a mile to the southward. This latter is in lat. 21° 8′ 19″ S., long. 175° 14′ 45″ W. The variation was 10° 13′ E., in 1777, and very nearly the same at present. High water, on full and change, at $6^h\ 58^m$; the tide rises 4 ft. 9 in. at springs, and 3 ft. 6 in. at neaps; the flood running to S.E., and the ebb returning to the same direction.

This road or harbour has two entrances; one from the East, the other from the North. The first is between the coast of Tonga-tabu and a chain of islets and reefs; the length of the passage is 9 miles in an East and West direction, and 1½ mile broad, reckoning at a small island lying precisely in the opening of the road; this entrance is preferable to the northern one, and is called *Astrolabe Channel* by D'Urville.

The following directions for making Tonga-tabu, and entering this anchorage, are by Mr. David Duncan, Master of H.M.S. *Zebra*:—Ships running for Tonga-tabu should try to make the Island of Eooa, which is moderately high; and, if toward evening, should keep off and on during the night, not losing sight of it, if possible, as there is a current setting to the westward.

At daylight bear up for the Island of Eooajii, which leave on your starboard hand, keeping over towards the reef surrounding the Island of Tonga, which makes low. As you draw in, keep close to the reef on the port hand, for the passage cannot be seen until close-to; but with a good look-out at the mast-head, and keeping the port reef close on board, it will be seen on the starboard bow.

In the narrowest part of the passage, eastward of Makkahaa Islet, there is a sunken rock, which you will avoid by still keeping the port reef close on board. After passing this, you have a clear passage up to the anchorage, which is

under some small islands to the eastward; or run to the westward, and anchor in 16 fathoms, about a mile from the shore, abreast of a flagstaff erected by the missionaries, on which is generally a flag.

There is a pilot, but he seldom comes out until you have passed the narrowest part of the passage, and then he is not required. The course is N.W. by N. ¾ N., which will take you clear of all danger, by keeping a look-out at the mast-head. It is high water, on full and change, at 8^h; and the rise of tide is 8½ ft., with easterly winds.

Commander Watson, H.M.S. *Miranda*, 1883, announced a shoal of small extent, lying in the fairway in the southern part of the channel between Makkahaa and the eastern reefs, with the East extreme of Maneema Islet bearing S. 7° E., and the northern extreme of Makkahaa, S. 84° W., distant 5 cables. The channel, about 1 cable broad, between this shoal and the sunken rocks on the S.W. end of the eastern reef, appeared to be clear.

The *North Passage*, by the N.E. of *Atata Island*, is thus described by Capt. Drinkwater Bethune, who came hither in H.M.S. *Conway*:—

"Having rounded the West end of the island, avoiding some reefs off it, all of which, I believe, are visible, I ran to the E.N.E. until past the Island of Atata. The passage into which I entered is to the northward of the middle reef, which is circular, and lies N.E. from Atata. The passage is about half a mile wide, with another reef about that distance North from the circular one. Having entered betwixt these two, it is necessary to keep to the S.E. for about 1½ mile, to avoid some stones that lie off the middle reef, and then haul up South by compass for Niukalofa, which may be distinguished by the church, built on the only rising ground near. I anchored in 14 fathoms, with the small reef bearing North, the church South, Panghaimotu E. by N., just shutting in the distant main land. With the prevailing S.E. winds, the usual passage in is between the East end of Tonga and Eooa Islands to the anchorage under Panghai-motu. The North Passage is to be preferred in going out, the passage West of Atata being narrow and intricate, and therefore should not be attempted without a leading wind.

"The landing is awkward, as a reef extends a quarter of a mile from the shore; but just to the eastward of the church a cut has been made, which admits a boat to approach the shore at high water. A pilot will come off on a signal being made."

A narrow bank of 3½ to 5 fathoms lies across the eastern approach to this channel, as shown on the chart, the least water being near its centre.

Captain Nares, H.M.S. *Challenger*, 1874, says:—"The ship was anchored at Tonga-tabu: on leaving the northern entrance we could not find the shallow bar indicated on the chart by a single line of soundings, with Mellenoah and Ataa Islands in transit."

In 1883 the German war vessel *Hyane* passed 2 cables northward of a break-

ing shoal, and sounded in 6 fathoms, with Mallenoah Island bearing South, and the South end of Atata S.W. ¼ S.

Admiral D'Urville gives the following account of the North Passage :—

"In leaving the anchorage of Panghai-motu to reach this passage, steer first for the point of Fafaa Reef, and from this to N.N.W. for 4 miles. You will then see the two reefs, taking care to keep close to the wind. The channel is hardly half a mile long; then, steering to N.W., you will soon be clear of the breakers to the North of Tonga-tabu.

"*Fafaa Reef* extends nearly a mile to the West of the islet of the same name. Up to this the depth varies from 18 to 10 fathoms; but as soon as you reach the line joining Malinoa and Holoa, the bottom has patches of coral, some of which have not more than 3½ fathoms on them, and perhaps less. The mouth of the pass is between the N.E. extreme of Atata Reef and a bank of detached reefs more to the East, about 3 miles N.E. ½ N. from Atata, and is not more than 1,600 yards wide. It is quite safe throughout, and easily made."

Shoals.—Capt. H. Reade, of the German ship *Confluentia*, 1882, reports the existence of several shoals, having 3 to 10 ft. water upon them, lying 3 miles West of Mallenoah Island, or nearly in the fairway to the anchorage off Niuka-lofa. Also, that a patch, with 1 fathom over it, lies nearly 4½ miles West of Mallenoah Island; it is marked by a *red buoy*. A shoal of 2¼ fathoms lies E.S.E., distant 2 miles from Atata Island. A patch, with 4 ft. over it, lies nearly midway between Juno Shoal and Augusta Rock; it is marked by a *red buoy*. Off Mafanga village, and about half a mile from the shore, is a shoal of 3 fathoms, marked by a *white buoy*. The German corvette *Augusta*, 1877, touched the ground in about 2 fathoms, near the fairway, northward of Juno Shoal, where a depth of about 7 fathoms was indicated upon the chart. Caution should therefore be observed when navigating in this neighbourhood.

H.M.S. *Dido*, in 1873, passed within a quarter of a mile of a reef on which the sea was breaking heavily, about 3 miles in a N. by W. direction from the North extreme of the main reef, on the North side of Tonga-tabu Island. This reef was seen from H.M.S. *Miranda*, 1883, marked by two lines of breakers in a N.N.W. direction, about 7½ cables and 2½ cables in length respectively; the least depth appeared to be about 4 fathoms, and it lies with the North extreme of the Eastern Reef bearing S.W. by S. ½ S., distant 3¾ miles.

When navigating this part of the group, allowance must be made for the current, which sets strongly to the westward.

Pilots can be obtained at Euaigee Island, which lies about 4 miles N.E. of East Point, Tonga-tabu Island.

Two coral banks, having upon them depths of 13 and 19 fathoms, were found by the *Hertha* about 12 miles northward of Tonga-tabu. The bank, with 13 fathoms upon it, measured about 13 miles East and West by 1 mile across, and its western extremity was determined to be in lat. 20° 55′ S., long. 174° 58′ W. The bank, with 17 fathoms upon it, appeared to be of small extent, and is

situated in lat. 20° 52′ S., long. 175° 6′ W. Breakers, also, were reported, in 1875, off the N.W. side of the island, in lat. 20° 54′ S., long. 175° 28′ W.

North Star Reef, a dangerous outlying coral bank, on which H.M.S. *North Star* touched in 1844, lies to the N.E. of Tonga-tabu, or, according to the chart, in lat. 20° 50′ S., long. 174° 35′ W. She touched only for an instant, and had 7, 9, 10, and 18 fathoms immediately afterwards.

Two small islands, *Honga Tonga* and *Honga Hapai*, lie between Tonga-tabu and Namuka. They are each about 1½ mile in circuit, and are merely gigantic rocks, 150 ft. high, and may be seen 45 miles off. Smoke has been seen issuing from the sea about 6 miles northward of Honga Tonga, and shoal water is suspected here.

NAMUKA GROUP.

The principal island of this group is that which gives it the name, *Annamooka*, according to Cook; or Namocka, according to Mariner.

NAMUKA is rather higher than the small surrounding islets, but still is low. It is composed of a steep, rugged, coral rock, 9 to 10 ft. high, except where there are two sandy beaches, defended, however, by coral reefs to seaward. In the centre of the island is a salt-water lake, without communication with the sea, and about 1½ mile broad. Cook found the island to be well cultivated, chiefly with yams and plantains, with bread-fruit and cocoa-nut trees interspersed.

To the North and East of Namuka the sea is sprinkled with a vast number of small islands and reefs. The islands, scattered at unequal distances, are in general as high as Namuka, but only from 2 to 3 miles to half a mile in length, and some less. Most of them are entirely clothed with trees, among which are many cocoa palms, and each forms a prospect, like a beautiful garden placed in the sea.

Culebras Bank lies somewhat to the westward of Namuka Islands, and was discovered by Maurelle. It does not exist in the position assigned to it, but is more likely nearer the land. La Pérouse saw it in 1787; according to him it is 6 miles in extent, N. by W. and S. by E. It may be the same as that stated to have been discovered in 1845, in lat. 20° 9′ S., long. 175° 8′ W., that is, to the S.W. of Kotoo.

Hakau-fiss Reef, north-westward of Namuka, in lat. 20° 9′ S., long. 174° 52′ W., is of semi-circular shape, about 3 miles long, by from 1 to 5 cables in breadth, steep-to, partly dry at low water, and open on its N.E. side.

The HAPAI GROUP, or, as it is otherwise spelt, Hapaee, Habai, or Havaii, was discovered by Cook in his third voyage, and is composed of four larger and numerous smaller islands, connected by coral reefs, so that they are considered by the inhabitants as but forming one island. Cook named them *Haano*, *Eoa*, *Lefouka*, and *Hoolaiva*.

These islands are very low; the reefs do not extend more than a quarter of a mile on the eastern side of the northernmost islands. In rounding Haano, the northernmost, it is necessary to give the N.W. point a berth of half a mile, to avoid a reef off it. From the point, N. 41° E., *true*, 6 miles, lies a bank with only 3 fathoms on it. *Bethune Shoal*, of 3 fathoms, placed on the charts at 6 miles N.W. of Haano, was not found by the German war vessel *Gazelle*, 1875, in this position.

They were visited by Lieutenant W. Creak, R.N., in H.M.S. *Esk*, in 1866. Nearly all the islands of the Hapai Group, sighted by the *Esk*, partook of the same character; from a distance they appeared low and flat-topped, and on a nearer approach a white sandy beach was seen encircling a densely wooded island, entirely surrounded by a reef. The only exception was Mangone Island, whose N.W. side appeared to be bounded by a low, rugged, rocky coast, and apparently (as seen from the mast-head) deep water close-to.

The *Esk* passed about half a mile North of the 6-fathoms patch, S.S.W. from Loohooga Island; it appeared to consist of a series of irregular patches of coral, of about a mile in extent. This shoal probably extends 2 miles farther S.S.W., for here soundings were obtained in 4½ fathoms, by the *Gazelle*, with Loohooga bearing N. by E. ¾ E.

After passing Mangone Island to the southward, the Islands of Lefuka, Foua, and Haano, appear as one long, low line of land, broken by gaps; if wishing to reach the Lefuka anchorage, steer for the second gap from the northward.

Lifuka, *Lefouka*, or *Leefooga*, one of the islands on the eastern bank, is the most interesting, as it was on this that Mariner chiefly resided, between 1806 and 1810, as described on page 533. It is also one of the three missionary stations in the Friendly Islands, Vavu and Tonga-tabu being the others.

Lifuka is not above 7 miles long, and in some places not above 2 or 3 miles broad. Its East side, which is exposed to the trade wind, has a reef running to a considerable breadth from it, on which the sea breaks with great violence.* It is a continuation of this reef that joins Lifuka to Eoa, which is not above half a mile distant; at low water the natives pass on foot from one island to another. No good water could be got; that which was procured was execrable. Near the South end of the island, and on the West side, they found an artificial mount, 40 ft. high, and 50 ft. in diameter at its summit.

"We stood in for the Island of Lifuka, running along to the westward of the islands Haano and Eoa, and at 9 a.m. (August 23, 1848), anchored in 17 fathoms; the West end of Haano, N. ¾ E.; and the North end of Lifuka, E. ¾ S.; the latter distant 2¼ miles, and from the nearest reef half a mile. Although

* M. Vincendon-Dumoulin states that a coral reef to the *East* of Lifuka serves as a base to a coral island. *Annales Hydrographiques*. vol. i, page 254.

we did not observe any shoals whilst running for the anchorage, I was afterwards informed that many existed, and great caution should be used in sailing in and out of this part of the group.

"The anchorage of Lifuka, where King George, king of the whole group, formerly had his residence, is in lat. 19° 48′ 12″, long. 174° 20′ W.,* and is by no means a good anchorage, being much exposed to the bad weather and high sea from the westward, the outstanding reefs affording but little or no shelter from the violent gales from that quarter, which frequently occur, particularly in February and March."—*Captain Worth, R.N.*

In the plan upon the Admiralty chart of Lefuka anchorages, Lefuka Point and the point south-westward of it, are not correctly placed, as the bearings were not found to agree. The unsounded ground northward of the tongue-like shoal, shown in the S.W. side of the same plan, abounds in detached patches.—*Gazelle*, 1875.

Hoolaiva is also connected to Lifuka by a coral reef, partly dry at low water. There was no trace of habitation or cultivation on it, which, by contrast, was rather extraordinary. Here, too, is an artificial mount. The East side of it has a reef like Lifuka, and the West side has a bending at the North part, where there seemed to be good anchorage. Westward of Lifuka and Hoolaiva the space is stated to be full of detached shoals.

The Kotoo Group may be almost considered as a portion of the Hapaï Group, as the distinction is not so well marked as in the others, being more or less connected together by coral reefs. According to Cook they are separated from them by a channel, 7 or 8 miles broad, but which is narrowed by a reef. The two islands forming the North end of this channel are *Neeneva* to the East, and *Foutoua*, or *Footooha*, to the West. The largest island of the group is called Kotoo, and is scarcely 2 miles long, and about the same breadth; a coral reef surrounds it. Its N.W. extremity is as low as Hapaï, and around it are eight other islands, as shown on the charts.

Tofoa, or *Toofoa*, an active volcanic island, lies to the N.W. of Kotoo, in lat. 19° 45′ S., long. 175° 3′ W., according to D'Urville, and is about 2,800 feet high. A remarkable lake is said to exist on it, from which the islanders bring small black volcanic pebbles, which are much in request, to cover the graves of their friends. It is covered with trees to the summit, and is about 5 miles in diameter.

Tofoa was in strong action at the time of Cook's second visit; they saw the smoke at Namuka, 30 miles off. He was told that it was but thinly inhabited, but the water upon it was good.

Kao is a vast rock of a conical figure, about 5,000 ft. high, to the N.E. of Tofoa. Its summit, according to D'Urville, is in lat. 19° 41′ 35″, long. 174° 59′ 50″.

* There may be some doubt as to the longitudes here, as Captain Virgin made the longitude of the East point of Haano to be 174° 22′, several miles more to the westward.

HAAFULUHAO ISLANDS, OR VAVU GROUP.

This, which is the northernmost cluster, is one of the most important, as it is perhaps as much frequented as any. It lies 70 miles N. by E. of the Hapaï Group, but the intervening space is much contracted by coral shoals. The local pilots say that there is a continuous line of soundings between the Hapaï and Vavu Groups, and that the sea has been known to break heavily in 20 fathoms.

Disney Shoal, a very dangerous reef, lies some 40 miles to the S.E. of Vavu. It was first seen in the *Frolic* whaler, October 29, 1841. Capt. Disney obtained soundings in 9 fathoms, sand and coral rock, deepening to 40 fathoms; but, from appearances, there was much less water than this. Lat. 19° 15′ S., long. 173° 40′ W. This position seemed satisfactory, but Captain C. A. Virgin, of H. Swedish M.S. *Eugenié*, in 1852, saw a reef in a different locality. Disney Shoal would bear N.E. by E., *true*, 35 miles from the N.E. point of Haano, whereas that seen by Captain Virgin would be N.E. by N. ¼ N., distant 25 miles. Perhaps the latter might be the water breaking on some part of the bank of soundings above mentioned, but it is desirable that a further examination should be made, and caution used. The German war vessel, *Hertha* (1876), passed the position of Disney Reef in a high sea, but could see nothing of it.

Campion Shoal (1860) lies to the East of a sandy islet to the South of Vavu, in lat. 19° 4′ S., long. 173° 52′ 30″ W., extending 4 miles to the S.W. Capt. Bröeker, ship *Carl and Auguste*, 1879, reported high breakers in lat. 19° 10′ S., long. 174° 6′ W., which he considered to be Campion Shoal. He also passed a reef which he places in lat. 19° 3′ S., long. 174° 3′ W. This reef, extending about 3 miles N.N.E. and S.S.W., has an extensive sand-bank upon it, and may be identical with *Accou Jago Islet*, formerly reported to be situated in lat. 19° 0′ S., long. 173° 52′ W.

Home Shoal, which we venture so to call from Sir Everard Home, who fixed its position in 1844, lies in lat. 19° 4′ S., long. 174° 39′, and is of coral, thus lying to the S.S.W. of the peak of Letté. This is probably the same as that seen by Capt. J. E. Montgomerie, in H.M.S. *Blanche*. He describes it as a rock a few feet above water; but, owing to the thickness of the weather, the correct position could not be ascertained. Lat. 19° 17′ S., long. 174° 45′ W. (approximate). Indications of volcanic action have been observed hereabouts.

Metis Rock.—An island about 200 yards long and 110 ft. high, situated in lat. 19° 11′ S., long. 174° 49′ W., was passed by H.M.S. *Sapphire*, 16th April, 1878. It ejected quantities of white smoke and appeared to be covered with sulphur. This island would seem to be identical with the rock 29 ft. high, reported by the *Metis* in 1875, the effects of volcanic action having probably added to its size, and may possibly be the same rock reported by the *Blanche*.

VAVAU or VAVU is the principal island of the group. Although Cook makes frequent mention of it in his Third Voyage, Maurelle was the first to visit it, in 1781, when he named them *Martin de Mayorga Islands*. La Pérouse saw them, but did not anchor. Captain Edwards visited them in H.M.S. *Pandora*, in 1791, and called them *Lord Howe's Islands*, and to the different islands of the group he gave the names of *Barrington*, *Sawyer*, *Hotham*, and *Jervis*; and the fine Port Refugio of Maurelle he calls Curtis Sound. Malespina made some stay here, in Port Refugio. Sir Everard Home thus describes it:—

"The island of Vavau, when approached from the West, has a very remarkable appearance. It is highest towards the North, sloping gradually to the South. The whole is a group of numerous islands, which, with few exceptions, show abrupt sides; towards the North steep cliffs, forming angles of 70° or 80° with the horizon. The extreme point North is of moderate height, but South of it there is a bold head of considerable height, forming an angle with the horizon of 75° or 80°. This is on part of the main island of Vavau; two others like it to the southward are islands, the land gradually sloping to the South. Towards the northern end of Vavau there is a remarkable piece of table land, the highest, and from which the land slopes off, all southward of it being islands of regular form and low. The entrance is South of the highest head before mentioned. The peak of the Island of Letté bore S. 68° W.; the North head, or highest head, N. 25° E.; and the South head bore South. This head is the North extreme of a larger island, the southern extremity of which bore S. 55° W.

"When standing in with the North head on the port hand, two remarkable round rocky islands will appear. Their tops are flat, and covered with brushwood, the lower half to the water's edge bare rock; they cannot be mistaken. Between the northernmost of the two islands and the main there is a detached rock. Passing between these two large rocks, or small islands, a rocky point will be seen upon the left, bearing S. 83° E.; after rounding which, at about a cable's length, another point, more high, and covered with trees to the water's edge, will appear also on the left, bearing N. 47° E. The passage appears narrow. Southward and eastward the land is composed of islands very numerous, and showing several openings to the sea, between some of which the breakers extend right across; the eye guided us in. A lumpish hill covered with trees will soon open, and a small low green island, which is left upon the right hand. At six we anchored under this hill in 30 fathoms water, sand, with a sandy point N.E., and the hill North. The village is to be seen upon a rising ground; there is a hill at the back of it.

"These islands are all formed of a hard rock, quite white, and, as I believe, of coral origin. They are thickly covered with trees of various sorts, and all of a very deep green. Cocoa-nuts appear to be most numerous. These islands, clothed as they are, and the rocks often showing between the foliage, the variety

of their forms, tints, and sandy bays, give the harbour a most beautiful appearance. Passing on, the natives are seen in numerous groups, lying under the trees; and canoes are seen passing and repassing in various directions. A few, and a very few, patches of cleared ground are to be seen upon the hills.

"The village of *Neafu*, like Niukalofa at Tonga-tabu, is rendered conspicuous by the large boat-houses upon the beach, their gables open to the sea. From the anchorage to the village the water is deep, the shoalest being 5 fathoms, but the bottom is bad. The usual anchorage above Sandy Point is secure; the bottom is sand. I landed upon a good stone pier, built by King George."

At the time of the visit of H.M.S. *Curaçoa* to this island, in 1865, David Unga, son and heir of King George, was the resident Governor of Vavau, his residence being at Neafu. Much had been done in Christianizing the natives by the Wesleyans, who have a free church here, and Roman Catholics. Roads were being constructed by prisoners. The chief product of the island is cocoa-nut oil, a little sugar-cane and cotton being grown. Yams, sweet potatoes, taro, bananas, pineapples, cabbages, and onions, were under cultivation. The population of Vavau and the surrounding small islands was about 4,000, indicating a diminution in a few years.

Lieut. Creak, R.N., says:—To round Sandy Point, keep the Talau shore close on board till past the reef, which generally shows plainly. The longitude of Sandy Point was found to be 174° 1′ W. The height of Talau by aneroid barometer was found to be 440 ft.

Port Refuge lies off the West point of the island, its South end being formed by the islands which front *Port Valdez*, above described by Sir Everard Home. The village of *Neafu* stands in lat. 18° 38′ 20″ S., long. 173° 55′ W., and here the German firm of Godeffroy had an establishment for the export of cocoa-nut oil.

We cannot here describe the coral reefs and islets which extend to the southward and S.W. of Vavau; they are all marked on the chart. Many interesting details of Vavau will be found in Mariner's account of the Tonga Islands.

Latte or Lette Island lies to the West of the Vavau Group. It is a high island, formerly a volcano. The peak, 1,790 ft. high, is in the centre of the island, from which the hill falls with a pretty gradual slope into the sea. The island is 6 or 7 miles in circumference, and is sufficiently high to be seen at 60 miles off. Edwards calls it *Bickerton Island*. From the observations of D'Urville, in the *Astrolabe* and *Zelée*, it is in lat. 18° 45′ 15″ S., long. 174° 28′ W., but it is probably 12′ further to the westward. Lieut. Creak found the meridian distance to be $2^m\ 42^s$ West of Sandy Point of Vavau.

It was visited on November 3, 1866, by H.M.S. *Esk*, Lieut. E. W. Creak, R.N., who says:—

From the South side round by East to the N.W. the island is bare and

rugged, with deep fissures about a third down from the crater; below the fissures a quantity of scrub grows. The remaining portion is well wooded, showing a few patches of cocoa-nut trees and large quantities of iron-wood. Near the landing place are the remains of a village, and several trunks of old trees were observed standing against the rocks.

Wild pigs and pigeons abound in the bush, and from the hollow cocoa-nut trees left by former inhabitants a small quantity of rain-water is obtainable.

On the East coast there is a second crater, now extinct, which the landing party report to be oval in shape, the inner sides rising perpendicularly from a small flat ledge surrounding a lake of water, whose depth and quality they had no means of ascertaining. The large crater gave out a vaporous looking smoke, and small jets were seen issuing from its sides. No dangers were visible beyond a cable from the shore, nor were soundings obtainable with the hand lead a quarter of a mile from the landing place. On two occasions breakers were reported, but they turned out to be the swell in the tide-rip meeting opposing squalls of wind from off the island, and causing a strong resemblance to breakers. They disappeared with the tide-rip.

A line of breakers lie a considerable distance West of the island; they were seen by Sir Everard Home, and appeared to be caused by an extensive reef stretching East and West.

AMARGURA, or Fanoualie, is the northernmost of the group. Maurelle named it Amargura (bitterness, Spanish), because he was disappointed in obtaining fresh provisions here. Edwards called it *Gardner's Island.* It is a barren spot, with no trees and no signs of inhabitants. It is formed of two hills, the N.E. the higher, connected by a very low space, everywhere surrounded by rocky cliffs, except in two places on the West side. Capt. Worth passed it in H.M.S. *Calypso*, in 1848. His position is lat. 18° 2′ S., long. 174° 16′ W. There is said to be a dangerous reef about 4 miles West of it.

In August, 1847, Amargura was destroyed by the eruption of its crater, which, according to the Rev. Mr. Lawry, was heard at Niua Fu, 160 miles distant, and it damaged the crops and trees at Vavau, 35 miles off. Ashes were thrown in large quantities on passing ships, 500 and 600 miles to the N.E. Banks were also said to have been raised above the level of the sea, eastward of Tonga-tabu, and a reef is said to extend under water, half a mile eastward of the island.

Toku is a small low island, 11 miles E.S.E. of Amargura, in about lat. 18° 8′ S., long. 174° 8′ W., with a reef to the S.W. of it.

Amargura and Toku Islands do not agree in bearing, in the positions they are at present placed in upon the charts; and the rock marked P.D. 2½ miles S.W. of Toku Island is not more than a mile distant in reality.—*Capt. von Schleinitz, German war vessel Gazelle*, 1875.

To the south-westward of Tonga-tabu is a line or cluster of reefs and an island, which apparently is a prolongation of the line of land composing the Tonga Archipelago, and which, as it is subject to earthquakes, may assume a dangerous character should the depth of water be lessened through this agency. Between the Friendly Islands and Kermadec Islands, many shoals have been reported of late years, which could not afterwards be found. (On p. 305 are some remarks concerning these reported dangers.)

KAAFA or PYLSTAART ISLAND, the earliest known, is one that does not belong to any particular group. Its name was given by Tasman, the discoverer. Freycinet places it in lat. 22° 24′ 45″ between Cook and La Pérouse), long. 176° 2′ W. It is 600 ft. high, covered with trees, cocoa-nut among the number. It was called *Sola Island* by Maurelle. In 1865 Kaafa was uninhabited, the population having emigrated to Eua. It is 3 miles in its greatest length, and without any anchorage.

Pelorus Reef was discovered by H.M.S. *Pelorus*, July 12, 1861. It lies 37 miles S. by W. from Pylstaart Island, which is in sight from it. It is about a quarter of a mile in length, with not more than 1 or 2 fathoms water on its western end, at the extremity of which breakers were visible, lat. 22° 52′ 15″ S., long. 176° 27′ 50″ W. Midway between Pelorus Reef and Pylstaart is a bank of 22 fathoms.

Seymour Bank, of 6½ and 7 fathoms, very steep-to, was also crossed on the same day to the N.E. of the former, in lat. 21° 43′ S., long. 176° 42′ W. It may be that this is a growing coral reef, and therefore the utmost caution is requisite, as the lead may not be of much use in nearing it.

H.M.S. *Pearl*, 1875, passed over the position of the shoal marked *doubtful* on the charts, in lat. 22° 5′ 15″ S., long. 175° 28′ W., 37½ miles S. ¾ W. of Eooa, and nothing was seen of it.

La Rance Banks.—On the 27th of January, 1872, at 10 a.m., the French transport *La Rance*, commanded by Lieutenant Chevalier, was running at the rate of 9 knots, with a fresh breeze from the S.E., when a sudden change in the colour of the sea was observed. The ship was hove to, a boat lowered, and an officer sent to sound; 3¼ fathoms, then 12, 22, and 16 fathoms was found on a bank which appeared to extend 4 miles in a North and South direction.

When the *La Rance* crossed the western part of this bank, the look-out man reported a large bank about 9 miles to the N.W., with the sea breaking over it; a lagoon was observed at its N.E. end.

A third shoal bank was also seen about 2 miles northward of the *La Rance*; there appeared to be less water on this bank than on that which was sounded over; and lastly a fourth bank was observed about 11 miles to the southward, which appeared to have a greater depth. The position of the depth of 3¼ fathoms, deduced from the noon observations of the *La Rance*, was determined to be in lat. 24° 18′ S., long. 176° 1′ W.

These banks were unsuccessfully searched for in their assigned position by H.M.S. *Pearl*, 1876, by Captain von Werner, of the German corvette *Ariadne*, 1878, and by H.M.S. *Alert*, in 1880, and their position was also passed over by H.M.S. *Nymphe*, in fine weather; from these reports the position of the banks appears doubtful. However, H.M.S. *Wolverene*, 1879, sounded in 38 fathoms, rock, in lat. 24° 59′ S., long. 174° 46′ W., and after steering *N.* 11° *E.* (*true*) for 2 miles, sounded again in 39 fathoms, coral, at about 70 miles south-eastward of the doubtful position of La Rance Banks.

McCloud Bank, of 17 fathoms, is placed in 25° 12′ S., 178° 30′ W., and *Kriemhilda Rock* is reported to have been seen by a vessel of that name, in 1877, in lat. 24° 50′ S., long. 174° W.

Soundings were obtained in H.M.S. *Wolverene*, 1877, between lat. 25° 24′ and 25° 37′ S., and in about long. 179° 4′ W., in 27 and 40 fathoms, black sand. Shoaler water may exist.

Ono Islands are a group of several small thickly wooded islands, the highest and largest of which is elevated 370 ft., and is 2 miles long by about a mile broad. A chain of coral reefs, 5 miles long N.E. and S.W., by about 4 miles wide, surrounds the group, the centre of which is in lat. 20° 39′ S., long. 178° 41′ W. These islands, together with Michaeloff and Simonoff, next described, belong to the Fiji group.

Ono, according to Captain Worth, R.N., is a small but very productive group of islands, the inhabitants being exceedingly well behaved and industrious, and having a great horror of cannibalism. It is low, and is formed by a cluster of six islands enclosed within one reef, which forms a sort of lagoon, and contained about 400 inhabitants, all of whom were Christians, and of whom the missionary spoke in the highest terms. In 1880, they were 440 in number, living on the three larger isles. A few fowls and cocoa-nuts may be obtained, and fresh water from springs.

From the islands, the surrounding oval rim of the reef extends $1\frac{3}{4}$ mile S.W., 2 miles N.E., and only three-quarters of a mile N.W. and S.E. The S.W. elbow is marked by breakers only; but the other edges are denoted by islets covered with trees. The accessible part of the reef for canoes or whale boats, may be looked for on its N.W. face, with the peak bearing S.S.E.

Anchorage during S.E. winds and fine weather, may be found on the N.W. side of the reef encircling the islands, with the peak bearing S. $\frac{1}{2}$ E., and Konaoe or Doi Island peak S.E. by E.; here Mana Islets, on the South side of the reef, will be about half their own breadth open of the West side of Konaoe, and the depth will be 14 fathoms, rocky bottom.

It is high water, on full and change, at the Ono Islands, at 6^h, the rise being 4 ft.

Michaeloff and Simonoff Islands are two small uninhabited islands to the South of the Ono Isles; the first, in Fiji *Tuvana-i-ra*, is named after the artist attached to Bellingshausen's expedition; the other, *Tuvana-i-tholo*,

named from the astronomer of the expedition, is in lat. 21° 1′ 30″ S., long. 178° 46′ 20″ W., about 5 miles S.W. by W. ¾ W. from Michaeloff.

They are two low, densely wooded sand kays, visible 12 miles in clear weather, surrounded by inaccessible reefs which break heavily, and can always be seen during the day; but as the tops of the trees are only about 95 ft. above the sea, these islands should be given a wide berth to, if not sighted before nightfall. They are each about half a mile in diameter, and do not occupy the centres of their respective reefs, which are circular, but are situated nearer their northern edges. The Simonoff reef extends three-quarters of a mile, and that of Michaeloff, half a mile, to the southward of the respective islands. The edges of these reefs are 4½ miles apart, having a clear deep passage, well defined by breakers, between them, without any current. A canoe might land at times on the North side of the islands.

Bereghis Reef (*i.e.*, be careful), was so named by Capt. Bellingshausen, because he nearly lost his vessel on it. It is an oblong reef, steep-to, awash, and always breaking, 2½ miles long W.S.W. and E.N.E. by 2 miles wide. Ono Island peak bears N.E. distant 8 miles from its N.E. elbow. Its native name is *Vuata Ono.*

Calinon Reef.– M. Calinon, a French missionary on the Tonga Islands, gave to Capt. Erskine, H.M.S. *Havannah*, the particulars of a reef, which was 2 or 3 ft. above the sea, about a quarter of a mile in extent, no vegetation, and which the natives said had risen from the effects of an earthquake; and as they are seldom mistaken on such points, they may be trusted. It is in about lat. 20° 21′ S., long. 179° 24′ W., or 35 miles north-westward of Ono.

It was thought at first that it was upon this that the whaler *United States* was wrecked, December 22, 1848, but the natives also say that there is another *bank* more to the westward, in the direction of Fiji, which is longer than the above, and does not rise above the level of the sea. Perhaps this latter is the *Alfred Reef* reported by Capt. Davenport, of the ship *Alfred*, to lie in lat. 20° 10′ S., long. 179° 15′ E., and said to be "an acre in extent with 12 ft. over it"; H.M.S. *Alert*, 1880, could find no bottom at 300 fathoms in this position.

MINERVA REEFS.—Two reefs are marked upon Arrowsmith's chart, near together, stated to have been discovered in 1818, by Capt. Nicholson. According to Norie's chart, the ship *Minerva* was lost here in 1831, on the southern of these reefs; they have therefore been called Minerva Reefs.

Their character and position were accurately established by Capt. Denham, R.N., in the *Herald*, August, 1854. The northern reef has a passage, a cable wide with a depth of 15 fathoms, on its N.W. side leading into tranquil water within. At 2 cables off the entrance to this passage is a depth of 55 fathoms. The northern reef is circular, about 3½ miles in diameter, enclosing a space in which the depths vary from 3 fathoms at 3 cables from the edge of the reef to 15 and 17 fathoms in the centre of the enclosed space.

The southern reef resembles the figure 8 in shape, and encloses two separate lagoons. Its greatest length is E.N.E. and W.S.W. 5 miles, with a mean breadth of 2 miles. There is an entrance into the easternmost of the lagoons called *Herald Bight*, on its N.W. side, and off the entrance is a sheltered anchorage during the S.E. trade. This entrance is a mile wide between the reefs, but several patches of 9 to 12 ft. extend three-quarters across from the northern side. The navigable passage, with a depth of 15 fathoms, lies to the southward of these, and is 2 cables wide. Inside is a circular space of tranquil water, 1½ mile in diameter. Two sunken dangers lie within half a mile from the entrance, each about 3 cables from the southern shore of the lagoon; and a third lies 2 cables S.S.E. from the innermost of these, and 1½ cable distant from the reef.

Northern Reef, observation spot on the N.E. side of reef, lat. 23° 37′ 19″ S., long. 178° 49′ 39″ W.

Southern Reef, observation spot just within Herald Bight, on South side of entrance, lat. 23° 56′ 22″ S., long. 179° 4′ 57″ W.

They both partake of the coral reef, or atoll, character. A sounding of 967 fathoms was found between them, the bottom consisting of shells and microscopic animalculæ. High water, on full and change, 8^h; rise 6 feet.

It is evidently the southern reef on which the whale ship *Canton*, Capt. Folger, struck a few days after Capt. Denham left, but it is stated that they saw a few black volcanic rocks scattered over it. The whale ship *Caroline*, Capt. Gifford, was probably also lost on the southern part in 1865.

KERMADEC ISLANDS.

A scattered group of islands to the N.E. of New Zealand, which has been very badly placed on the charts, is first denominated the Kermadec Islands in the chart accompanying Admiral Rossel's account of D'Entrecasteaux's voyage. The first of them, Macauley and Curtis Islands, were discovered by Lieut. Watts, in the *Penrhyn*, in 1788. Raoul Island and L'Espérance Rock were discovered on March 15, 1793, by the *Recherche* and *L'Espérance*. There has been thus some confusion of names, and this was not diminished by an extra island, Sunday Island, which appeared in Arrowsmith's chart, which must be identical with Raoul Island. Since their original discovery their character and position have been more exactly fixed by subsequent navigators. They are in West longitude.

RAOUL or SUNDAY ISLAND, the northernmost, was discovered by Admiral D'Entrecasteaux, March 15, 1793. It is of a triangular form, and not more than 12 miles in circuit. It forms a high, rugged mountain, very steep, and covered with wood. It has every appearance of being volcanic, and the rocks rise like basaltic columns.

Its position was accurately determined by Capt. Denham, in the *Herald*,

July, 1854. He says it offers three anchorages, according to the winds, and that water, vegetables, and poultry, could be procured by the whalers in the summer, or whaling season. Its maximum altitude is 1,627 ft. Its only inhabitants consisted of one family from New York, named Halstead, of whom Capt. Denham speaks in the kindest terms for their humane disposition, shown under the trying circumstances of having to inter a beloved son close to their settlement. However, the frequency of earthquakes and a sudden eruption of the volcano caused them to abandon it, and it is now probably uninhabited. The observation spot in the West bay is in lat. 29° 15′ 30″ S., long. 177° 54′ 52″ W. High water, on full and change, 6^h; rise 5 feet.

Wolverene Rock, with about 9 ft. on it at low water, was found by H.M.S. *Wolverene*, 1877, near the centre of Denham Bay. Depths of 4 and 7 fathoms were found at from 1½ to 2 cables W.S.W. of the rock, and, judging from the appearance of broken water in the bay, it was concluded that more foul ground might exist.

Macauley Island is a small round island, very steep, with some tufts of herbage and a few bushes, but not a single tree. It is about 3 miles in circumference, and its height may be about 750 ft. Off its S.E. point is a small rock, half a cable's length distant. Lat. 30° 16′ S., long. 178° 32′ W.

Curtis Island is composed of two rocks of moderate height; the largest, which is double the size of the other, is half a mile in length; they may be about 500 ft. high. The channel separating them is about 400 yards wide. They are resorted to by numberless birds. D'Urville placed it, in 1837, in lat. 30° 36′ S., long. 178° 37′ 20″ W., or 6′ East of that assigned to it by D'Entrecasteaux. But it had been removed on the charts to long. 179° 14′, when the Kermadec Islands were more correctly known. Capt. Hope passed this last-named position in H.M.S. *Brisk*, in 1866, without seeing it; but he heard from a whaler that D'Urville's longitude was correct. Then it may be taken as lat. 30° 36′ S., long. 178° 37′ W.

Commander Cabaret, of the French steam-vessel *La Rhine*, 1876, reports that he passed a line of breakers at a distance of 2 miles, extending about 600 yards East and West, in lat. 28° 8′ S., long. 179° 37′ 10″ E., or about 140 miles N.W. by W. ½ W. of Raoul. In 1880, fifteen days were spent by H.M.S. *Alert* in a close examination of this vicinity, but no trace of the shoal was found, there being no bottom at 300 to 650 fathoms. It has been removed from the Admiralty charts.

Capt. Ranzon, of the German schooner *Olozenga*, 1876, reports having passed a rock with apparently little water over it in about lat. 29° 48′ S., long. 176° 45′ E.

L'Esperance Rock (*Brind's* or *French Rock*) is 577 ft. high, and of small extent, and is placed by D'Entrecasteaux in lat. 31° 27′ 30″, long. 179° 5′ W. (corrected). *Havre Rock* was seen by a whaler about 12 miles N.W. of it; it

was also seen by Capt. George Rule, of Nantucket, in 1824. He at first thought it was a whale breathing.

It was again seen by a whaling captain, who reported it (with the two following) in the Honolulu Advocate and Friend, November, 1844. He says it is 10 miles N.N.W. from French or Espérance Rock. It is just awash, and breaks heavily in boisterous weather.

A second reef, by the same authority, lies 45 miles E.N.E. from Espérance Rock. It was said to have 12 ft. water over it, but no breakers were discovered; lat. 31° 14′ S., long. 178° 8′ W. H.M.S. *Nymphe*, 1878, passed near this position without seeing it, nor could bottom be obtained with 55 fathoms of line.

A third was found to be in lat. 31° 28′ S., long. 178° 10′ W., bearing West from Espérance Rock, 133 miles distant from it. Heavy breakers are discerned when the surface is roughened by the wind. *Somme Reef*, which may be the same as the preceding, is marked on the French chart in lat. 30° 55′ S., long. 178° 5′ E. A reef, reported by the schooner *Edith*, in lat. 30° 50′ S., long. 178° 23′ E., was twice searched for in vain by Lieut. Moore, H.M.S. *Alacrity*, in 1878 and 1879, and it was considered probable that it was identical with Somme Bank.

In 1877, *Vibilia Rock* was reported to have been seen by a schooner of that name in lat. 31° 50′ S., long. 178° 20′ E.

What bearing these may have on the Rosaretta and other reported reefs need not be discussed here, but they want further verification.

Between the southern extremity of the Friendly Islands and New Caledonia there are several islands and reported reefs.

Conway Shoal (or *Rapids Reef*), discovered in 1838, has been many times reported as a new discovery, and has also been called *Mercator Shoal*, having been seen in the ship of that name. The assigned positions do not vary too much to prevent this identification. It lies in lat. 21° 44′ 48″ S., long. 174° 37′ 45″ *East.* This position was ascertained by Capt. Denham, who states that the sand islet on it is 5 ft. above water. Some mould was landed and some cocoa-nuts planted on it, in the hope that they might make a beacon for this fearful reef. It was visited by H.M.S. *Alacrity*, in 1876; the kay was about 6 ft. above water, with two bushes of scrub visible, and it was about 180 yards in length by 80 yards in breadth; the sea was seen breaking on it from a distance of 7 miles.*

* To the southward and eastward of Conway Shoal we have several reports of dangers which may have reference to earthquake shocks, one of which was felt in February, 1867, in lat. 22° S., long. 126° E. The English brig *Isabelle* reported dangers in the following positions: in lat. 22° 5′ S., long. 179° 15′ W.; in lat. 22° S., long. 177° 46′ E.; and in lat. 22° 38′ S., long. 174° 53′ E. (a horse-shoe reef). The *Atalante*, Admiral Roussin, proceeding from Tahiti to New Caledonia, passed 3 miles North of the first; 6 miles North of the

HUNTER ISLAND was discovered by Capt. Fearn, in the *Hunter*, in 1798. It was examined by Capt. Denham. It is a volcanic block, with its summit elevated 974 ft., while only spreading at its base half a mile North and South by one-third of a mile across. Its abrupt slopes are wooded, although jets of sulphureous vapour issue therefrom; it is not in other respects active as a volcano. Two days attempts to effect a landing proved abortive. There is 40 fathoms water within half a cable of its base, and within a mile 500 fathoms, over black sand. There are no outlying dangers, although the eddies extend for nearly 2 miles off its north-western side. It is in 22° 24′ 2″ S., and 172° 5′ 15″ E. It seems to harbour less sea-fowl than anticipated, and is classed with the New Hebrides range.

In the "Nautical Magazine" for July, 1841, Capt. W. Goodwin, of the *Florentia*, says, that on the 15th March (no date) his attention was attracted by a singular white cloud, which, on closer examination, proved to be smoke from Hunter Island, just on the horizon. He stood on to within 4 miles of the East end of the island, and on opening the northern point, saw at times a body of fire running from the summit to the base, in a cleft or chasm, to the water's edge. It was watched until a very late hour with the same appearances.

Matthew Island was discovered by Capt. Gilbert, in the ship *Charlotte*, in 1788. It is small, but high enough to be seen 30 or 35 miles off. It was also described by Capt. Fearn as being 42 miles from Hunter Island. Capt. Denham says it is 465 ft. high, and in lat. 22° 20′ 12″ S., long. 171° 20′ 30″ E.

Capt. Edwards, of the schooner *Melaine*, 1870, reported a rock of a red colour, 3 to 6 ft. above water, to lie 5 to 10 miles W. by N. of Matthew Island; another account places it in lat. 21° 26′ S., long. 170° 59′ E. It was unsuccessfully searched for by H.M.S. *Beagle*, 1875, in both these positions.

LA BRILLANTE SHOAL is a very dangerous reef, discovered in the French corvette *La Brillante*, under the command of M. Le Comte Dubouzet, 28th August, 1847. It appeared to be a mass of coral, of a round form, and is about 150 ft. in diameter. It was the more dangerous as the sea did not break on it, although there was a heavy swell. Two soundings in 20 and 23 fathoms were obtained; but it was thought that there was not more than

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second; and 2 miles N.W. of the third; but saw no indications of any banks or other danger. *Sprague Reef* was said to have been discovered by the commander of the ship *Mercator*, in lat. 21° 52′ S., long. 178° 36′ E.; H.M. ships *Alert* and *Alacrity*, 1880, searched for this reef without success, finding no bottom at 660 to 880 fathoms, and it has been removed from the Admiralty charts. On the 31st of January, 1872, the *La Rance* passed near a patch of *discoloured water*, which appeared to extend North and South for about 6 miles. It was estimated to have a depth of from 8 to 11 fathoms, and was placed by observation in lat. 24° 11′ S., long. 172° 54′ E.

6½ to 10 ft. on it at most, as the sea was quite yellow. Its position was taken to be in lat. 23° 13′ 52″ S., long. 169° 55′ 38″ E.

La Brillante Shoal was sought for ineffectually for six days by Capt. Denham, in H.M.S. *Herald*, and who considered that the whole space to the S.E. of the Island of Pines, between 23° and 25° S. and 167° and 170° 30′ E., was entirely clear.

Nevertheless, this important danger exists as previously stated. It has since been seen by a French ship in 1856, placing it in lat. 23° 9′ 30″ S., long. 170° 11′ E. (Ann. Hydrog., 1857, tome xiii., p. 7). It was also seen by Capt. Krabbe, in the *Creole*, October, 1859, placing it in lat. 23° 14′ S., long. 170° 6′ E. The latter authority says it is most dangerous, the shoal part not more than 2 cables' lengths in circumference, with not more than 6 ft. water on it.

It was also seen, the sea breaking fearfully on it, on October 31, 1869, by Capt. H. Halvarsen, of the Norwegian barque *N. C. Kierkegaard*. He says it is now very near the surface of the sea—perhaps only 2 or 3 ft. water on it—as the tops were occasionally to be seen. The reef extends for about half a mile, and was seen from the mast-head plainly for several hours, the weather being very calm. All round the reef the water had a yellowish colour. No bottom with 95 fathoms within a mile of it. The latitude observed was identical with Count Dubouzet's, but the longitude is 7′ East of the discoverer's. As the descriptions do not quite coincide, unless this latter was at low water, it is possible there may be two reefs.

H.M.S. *Alacrity*, 1876, passed over its position as given by Count Dubouzet; no signs of shoal water were seen and no bottom was obtained at 320 fathoms.

Walpole Island was discovered by Capt. Butler, of the *Walpole*, November 17th, 1794. It is a narrow table surface, coral structure, covered with herbage, without any prominent trees, and elevated 229 ft. above the base of its perpendicular cliffs. It lies North and South, 1½ mile in length, and a quarter of a mile in breadth; very difficult of access, uninhabited, and in January (about midsummer) presented but few sea birds. According to Capt. Denham, R.N., the southern extreme is in lat. 22° 38′ 7″ S., and long. 168° 56′ 45″ E.

The island is free from outlying dangers, but affords no anchorage, there being as much as 180 fathoms water at half a mile off its southern extremity, while no bottom with 230 fathoms could be found along its sides at one-third of a mile off. It appears to be of the Loyalty range.

O'Neill Bank, about 12 miles N. by W. of Walpole Island, was passed over by the French transport *l'Orne*, in 1874, when the least depth found was 12 fathoms, but another authority states there is only 5½ fathoms on one part of it. It lies in lat. 22° 26′ S., long. 168° 56′ E. A depth of 7 fathoms was reported in 1877, at 12 miles N.E. by E. ½ E. of it.

Durand Reef was seen the same day as Walpole Island, by Capt. Butler;

its centre is in lat. 22° 2′ 25″ S., long. 168° 39′ 34″ E., according to Capt. Denham. It covers 6 to 9 ft. It is subject to occasional breaks, which would be fatal to a vessel, while in moderate weather she might ground upon its 9 ft. ridge, which forms a circle of two-thirds of a mile in diameter. The lead will not warn of approach to Durand Shoal, as there is 210 fathoms, coral grit, within half a mile of its breakers.

NORFOLK ISLAND was discovered October 10th, 1774, by Capt. Cook. It forms a portion of the British colony of New South Wales. It is a beautiful island; all early visitors speak loudly in its praise. It was said of Norfolk Island, in 1798, that it had arrived at a state yet more flourishing than Port Jackson, "the air being more soft, and the soil inexpressibly productive. It is a perfect image of paradise. Our officers and their ladies, while they never regret their absence from Old England, were very sensibly affected at their departure from their insular garden, and at their banishment to Sydney." It was then abandoned by the government, but subsequently was again formed into a penal settlement, for doubly-convicted and the more important felons from the colony of New South Wales. Norfolk Island, says an "officer on the spot" in 1847, is by nature a paradise, endowed with the choicest gifts of climate, scenery, and vegetable productions; by art, society, or policy, a hell, disfigured by crime, loathsome vice, and misery.

Its present occupants are of a very different character. The convict establishment was broken up on May 7th, 1855, and on June 8th, 1856, the interesting community from Pitcairn Island, amounting to 194 persons, were landed here without accident. Everything belonging to the *Bounty* was brought with them, and the island, with its buildings, 2,000 sheep, 300 horses, pigs, poultry, &c., were given to them, a free and handsome gift from the British Government. Pitcairn Island had become too small for their increasing numbers; and thus, after a sojourn of 67 years in their first home, they have found an excellent and permanent resting place. Forty of the number, however, soon returned to Pitcairn.

The island had been brought into a high state of cultivation by the convict labour, and its roads, buildings, and gardens were in admirable order, but from the few able-bodied men, and their different tastes and habits, these have all become neglected and ruinous. The island was divided into plots of 50 acres, and each adult male is allowed a section, drawn for by lot, but it will be many years before they are all occupied, and still longer before they are brought into cultivation, for the wants of these simple people are few and easily satisfied. Whale fishery is their favourite occupation, and this and their farm produce, which finds a market at Sydney, supplies them well with all luxuries.

The old convict town, with its huge dilapidated barracks and gaols, officers' houses and servants' huts, is situated on the S.E. edge of the island, where the little Nepean Islet gives shelter enough to form a precarious roadstead,

available in certain winds. This old town is occupied by the ex-Pitcairners, now some 300 strong, all told. Three miles from this across the island, on its north-eastern shore, and communicating by a fair road with 'the town,' and also by a fair road some 3 miles long, with the other eastern landing place at Cascade Bay, lies the Mission estate of about 1,000 acres, facing North, and sloping gently down to low cliffs and a rocky shore. The land—a low table flat, broken by gentle gulleys—is a light red soil, of fair quality, covered naturally by a close growth of wild couch grass, sprinkled, after a beautiful park-like fashion, with Norfolk Island pines and 'white oak,' while the gulleys and flanks of 'Mount Pitt' are full of thick growth of a wild lemon scrub, tree ferns, wild cotton and wild tobacco, and guava. On a slight ridge, half a mile from the sea stand the scattered group of wooden mission buildings."

The *group*, of which Norfolk Island is the principal, is 900 miles E.N.E. from Sydney, and 1,350 miles N.E. from Cape Pillar, in Van Diemen's Land. Norfolk and Philip Islands, the largest of the group, are about 3 miles distant from each other; and about a dozen others, the Nepean and Bird Islands, are little more than dry rocks distributed among them.

Norfolk Island is not quite 5 miles long, with a medium breadth of about 2½ miles, and is said to be 8,960 acres in area. Its greatest elevation is the double summit of Mount Pitt, 1,050 ft. high, standing on the N.W. corner of the island. The ascent to it is in parts very steep, but practicable for a horse. The entire island, with the exception of the settlement, may be seen from hence. Its sea front is high and precipitous, presenting cliffs of 200 and 250 ft. in height; and the small streams which occupy the ravines in winter fall in cascades, 30 to 50 ft. high, into the sea.

There is no spot round the island, sufficiently sheltered, where a vessel can take up an anchorage without being obliged to quit instantly to avoid wreck, in case an on-shore breeze springs up.

There are but two or three spots where landing is practicable, one at the settlement, another at *Cascade Bay*, on the North side of the island. The latter is described by Mr. Brenchley, who landed here from H.M.S. *Curaçoa*, as a charming spot, adorned with picturesque clusters of trees, above which soar, giant-like, magnificent specimens of the famous Norfolk Island pine. It has tolerable landing when the sea is calm. Even at the settlement the danger in landing is often very great, owing to the "Bar," or reef of rocks, the extremity of which boats have to round in order to reach a rude wharf. The accomplishment of this feat is perilous whenever there is a sea or ground swell rolling in from the S.W. The position of this entrance over the bar is, or was, shown by two trees on Nepean Island in one.

Sydney Bay, between Nepean Island and Point Ross, lies at the South side of the island. Its eastern boundary is at Point Hunter, near the windmill. The town called Kingston is agreeably situated, facing the sea, and about 500

yards from the shore at the head of Sydney Bay. When the tide is out a coral reef is seen stretching from the shore, at varying distances of from 100 to 700 yards. Boats landing are obliged to cross the reef. The sea all along the coast is of great depth. Besides this locality there were other stations for convicts, one at Longridge, about 1½ mile distant, and another at Cascade, on the North side.

Philip Island, named in honour of Arthur Philip, first governor of New South Wales, is about 1¼ mile long, with an average breadth of three-fourths of a mile; it bears S. 20° E. by compass, 3½ miles from the landing-place at Sydney Bay. Its most elevated part, a remarkable peak on its South side, is probably 200 or 300 ft. less than that of Norfolk Island. It is everywhere precipitous, furrowed by deep channels, and densely wooded, though the timber is small and of little value. At half a mile to the South of it there is a rock always above water.

Nepean Island is in lat. 29° 4′ S., long. 167° 58′ E. This island lies half a mile off the land, and for a larger portion of the passage between there are numbers of detached rocky banks. The channel is close to the reefs on the North side, and has a depth of 4 and 5 fathoms. N.E. by N. of Nepean Island, for a considerable distance, is a bank of sand and mud.

Nepean Island rises to the height of 50 ft.; it is a quarter of a mile long, and of a horse-shoe shape, open to the East. No water has been found on it, and its vegetation has almost disappeared, owing to a colony of rabbits, which, having destroyed everything edible, themselves perished. It is reported that, in 1793, this island was only a boat's length from Norfolk Island, but that, in 1797, two severe earthquake shocks were experienced, by the second of which the nearer point of Nepean Island was submerged, and the channel altered to its present form.

The inhabitants state that a sharp pinnacle rock, having 12 ft. on it at low water, lies due South of the West end of Nepean Island, distant three-quarters of a mile. This is the rock on which the ship *Mary Hamilton* was wrecked.

Point Ross is the southernmost point of Norfolk Island, and the S.W. point of Sydney Bay. To the East of it, as far as the bottom of the bay, the rocky banks extend a long distance off the shore, and the sea breaks all across them in a S.W. gale or heavy surf.

The *tide* flows, on full and change, at $7\frac{3}{4}^{h}$, and rises from 5 to 7 ft. The flood runs to the S.W. by S., and ebb to the N.E. by N. The tide makes two hours sooner on the Norfolk Island shore than in the stream and over towards Philip Island, and is sometimes irregular, but in general equal.

The space comprised between the western shore of New Caledonia and that of Australia, and South of the Solomon Islands and the Louisiade Archipelago, is bestrewed with an infinity of dangers. To this area, from its character, Flinders has proposed the very appropriate title of the CORAL SEA. As the

navigation of this part of the Pacific more immediately refers to that between New South Wales and Torres Strait, &c., we shall include all necessary notices of it in a subsequent section.

NEW CALEDONIA AND THE LOYALTY ISLANDS.

To the same great navigator to whom so much of our knowledge of the Pacific is owing we are indebted for the discovery (1774) of this the largest island in the great ocean, except New Zealand. It is the only one of his numerous discoveries, too, that he did not make a complete examination of. Captain Cook attempted to sail around its North extremity, but, on reaching lat. 19° 17′, he found that a line of reefs extended beyond his view to the northward, which his want of time prevented him from following up. He then essayed to round its South end, but met with a similar repulse, and thus he abandoned it for that time.

The French commander, Admiral D'Entrecasteaux, completed what Cook had left undone. He examined both the N.E. and S.W. sides of the island, and determined the limits of the frightful chain of reefs which form a continuation of the island both at its N.W. and S.E. extremities, the former reaching 150 miles from the end of the island. His stay at Port Balade, where Cook also remained, gave him the opportunity of reversing the opinion that Cook had formed of the natives. He found them to be the same fierce cannibal race that were described to exist at the Fiji Islands. Cook thought them more mild and peaceable than the Friendly Islanders. Later intercourse confirms what D'Entrecasteaux experienced. They numbered 5,000 to 6,000 souls, but have much decreased since the first discovery of the island. In appearance they are a fine race of a type intermediate between the Papuan and Polynesian. They were called *Kanaks* at the time of the discovery of the islands. The remains of aqueducts and other irrigation works, some of which are even now in use, point to the fact that the natives of the island in past times have been more highly civilized than they are at present.

A French missionary establishment was first founded at Balade in 1843, but, owing to the bad success of the mission, the members of it were obliged to quit, and take refuge in the Isle of Pines, in 1847. In 1851, a surveying party from the French corvette, *la Brilliante*, was attacked, and several lives taken by the natives at Balade, who were severely punished with a great destruction of property and life. It was owing to the description of the beauty of the country by the crew of this vessel that the French Government first thought of New Caledonia as suitable for a penal settlement in place of Guyana. In 1853, the French flag was planted on the island, and Port de France soon rose into existence.

The penal settlement was first established in 1863, by the arrival of a batch of 215 convicts, who were placed on the Isle Nou, or du Bouzet, near Nouméa. From reports issued in 1867 and 1869, by the French Government, we learn that the convicts are divided into four classes. Of the first class several have already been set up as colonists. The second class, of whom it is expected that little good may come, work at a farm at Yahoué, situated about 5½ miles from Nouméa. The third class are employed in making roads, and the fourth class kept under strict prison discipline on Ile Nou. The convicts can rise or fall from one class to the other according to their behaviour. Political prisoners are confined at Ile Ducos, 27 miles to the N.W., or at the Isle of Pines.

The progress of the colony has been very slow. In 1867 one sugar factory existed on the shores of the Dumbea, 12 miles from the capital; and in 1871 six of these factories had been established, but of late years great destruction has been caused among the sugar-cane and other crops by the locusts. Cotton is grown in small quantities. The news that gold is being worked in the valley of the Diahot River, on the northern part of the island, may stimulate the opening up of that little-known country. The necessaries of New Caledonia are mostly supplied in British vessels from Australia and New Zealand. In 1866 the imports were valued at £90,786, the exports at £4,553; in the year ending September 30, 1880, the imports were valued at £331,304, and the exports at £83,587, the latter consisting chiefly of copper, cobalt, antimony, nickel, and copra. A fortnightly line of packets runs between Nouméa and Sydney, and a monthly line to Marseilles. The principal places in the island are connected by telegraph.

M. Jules Garnier, in a paper read before the Geographical Society of Paris, in 1878, estimated the natives to be 35,000 in number, with 17,000 Europeans, including about 9,000 convicts, &c.

The French officers on the station have recorded some valuable nautical particulars, and have surveyed the S.W. portion. To the remarks of these officers, Capt. Tardy de Montravel, Lieut. Grimoult, &c., and the surveys of M. Bouquet de la Grye, Capt. Ferre, M. Banaré, &c., we owe many of the subsequent brief particulars. Sir Edward Belcher, Capt. Cheyne, and Capt. Denham, have also added to our knowledge.*

New Caledonia is about 216 miles in length, and 30 miles in breadth. Throughout this extent are two parallel ranges of mountains, separated by a central valley, but united here and there by transverse plateaux. The eastern chain has a regular and even outline, with few prominent peaks or summits to serve as landmarks. The average height of these mountains is about 2,500 ft., visible 50 or 60 miles off. It commences at Cape Coronation, the S.E. point;

* An exhaustive description of the present condition of the island will be found in a work by M. Charles Lemire, published in Paris, 1878, and entitled "La Colonisation Française en Nouvelle-Calédonie."

and at Cape Colnett, in the N.E., it begins to decrease in elevation, and terminates at the low N.E. point.

The western chain is higher and more irregular and broken than the eastern. Its ridges rise into points of 2,500 to 3,600 ft., and from its rugged nature is evidently the result of volcanic action. Thus while its straight eastern coast is skirted by an extensive coral reef, on which are some sandy islets, the western shore is broken up into peninsulas and bays, formed and sheltered by high islets, and also coral reefs which surround the shores and islets.

From the northern extremity of the island, in lat. 20° 4′ S., an immense reef, with many groups of islands, extends to lat. 18° 36′. These were seen by D'Entrecasteaux, but have not since been entirely examined. Still farther North is a group of islands, extending to 17° 50′ S., named the Huon Islets by the same navigator. The Isle of Pines, or Kunie, lies to the S.E. of the South point of New Caledonia, the interval of 25 miles between is filled with coral reefs, having deep and safe passages between. The S.E. extremity of the group is a coral patch 3 miles in diameter, on the South edge of which is an islet, in lat. 22° 46′ S., long. 167° 35′ 30″ E.

The S.W. point of New Caledonia is *Uen Island*, which was named by Cook *Prince of Wales Foreland*. A line of coral reefs extend from it to lat. 23° 1′ S., long. 167° 2′ E., a distance of 35 miles, leaving a wide gulf between it and the Isle of Pines Reefs, called by Capt. Hunter, 1791, Waakzamheyd (Vigilant) Bay.

The Climate of the group is like that of all tropical regions. The year is divided into two seasons, winter from December 15 to April 15, with variable winds, rains, and hurricanes; the other eight months is the fine season, with regular winds from E.S.E. with fine weather, although at times there are squalls from S.W. to South.

This division of the year is correct for the eastern coast, but less so for the western side, for this aspect participates in the monsoons of the Australian coast, and during the months of July, August, and September, westerly and south-westerly winds appear to be more prevalent.

Hurricanes are experienced most frequently in January and February, and are more violent to the North. Their southern limit is somewhere between Kanala and the Isle of Pines, for at the latter place they are not known. Although not much is recorded on the subject, yet they bear out the cyclone theory. They are much dreaded by vessels in the northern ports, and loss is considered certain if the ship is not in a landlocked harbour, the reefs being no shelter from the sea in these devastations,

The *Currents* generally are from S.E. to N.W., along the coasts and outside the reefs; within the latter they are subject to the tides, and the direction of the channels.

The ISLE of PINES is the south-easternmost land of New Caledonia. It is 11½ miles in extent N.W. and S.E., but the latter part is a separate island,

being divided by a very narrow channel. It may be premised that it is difficult to give a clear description of its features without a reference to the chart, which shows the numerous coral reefs and intricacies which surround it.

Near the shore the land is generally low and rocky, with little soil, but very thickly wooded. About 2 miles inland the soil improves, and from that to the centre of the island (on the North side) the ground rises with a gentle ascent, with very little timber; and a rich alluvial soil, forming a large clear space of hundreds of acres. From this clear space the land rises gradually towards the peak (which is situated on the S.W. part of the island), and is thickly wooded to the top. The peak *Nga* or *Ngao* is conical, 880 ft. high, visible 30 miles off, and from the S.W. shows double. It is in lat. 22° 39′ 20″ S., long. 167° 28′ E. At 2 miles S.E. of it is the Vao District, where there is a mission station, near a stream inconvenient for watering, and between which and the outer reef is a secure port, called *Vao*. At about 3 miles S. by E. of it is *Alcmène Island*, which shelters another anchorage to the West of it. On the S.E. side of the island are some shallow inlets. On the North side is the *Gadji Anchorage*, protected by the barrier reef; and on the West side is *Uamæo Bay*, with *Victoria Harbour*, so named by Sir Edward Belcher in 1840. To the S.E. of the Isle of Pines is a lagoon reef, called Nokanhui Reef, having a narrow channel inside it.

The island is most easily made from the eastward. Its conical peak will readily distinguish it. Having clearly made this out, steer for the sand islets *Ana* or *Ami*, lying on the S.E. side of Nokanhui Reef, which lies about 4 miles from the South point of the Isle of Pines; they are covered with bushes, and the southernmost is also at the South point of the reef. Having rounded this at a convenient distance, though not close-to, as the bank reaches off to the S.E., when this islet is on with the N.E. side of the Lesser Isle of Pines, keep on to W.N.W. till the summit of the peak bears N. 16° E., when *Alcmène Islet*, which is covered with the remarkable pine-trees, will be to the right of the peak.

Great caution must be used in approaching the *Alcmène Passage*, which lies to the West of the island, as many coral patches lie in its entrance, which can only be avoided by the eye. This channel is 1½ mile wide between the island and a cluster of coral patches, which separate it from the Nokue Passage. The mark for taking this passage is *Duroc Islet* (small, with pine trees), lying immediately under the Nga Peak, in one with its East summit, bearing N. ¾ E. This will carry through in 6 to 10 fathoms between the reefs on the starboard hand, and also clear of the reefs which extend for half a mile westward of Alcmène, which must be strictly guarded against. When the N.W. point of the islet bears S.E., bear to the E.N.E., and anchor as far in as needful, to the North of the island. It would be better for a large ship not to venture farther, except with a good knowledge of the channels; but if this is done, you can

keep on towards the peak and Duroc Islet till within half a mile of the latter, when an easterly course for 2 miles will take to a more sheltered anchorage than the former, called *Port Vao* (or *Assumption*), and anchor with the Mission Station bearing N.N.W. in 4 fathoms. Neither of these anchorages can be considered safe or convenient, as they are open to winds from South to N.W.; a vessel is liable to the squalls or gales from S.W., which are sometimes very violent. Besides this, communication with the land is difficult, and the tide rapid, the flood to the West, the ebb to eastward.

Although it is an indifferent port, it is a useful place for refreshments, as fresh provisions, poultry, pigs, vegetables, excellent potatoes, sheep, and sometimes even beef, can be got from the natives, and a few foreigners established near the mission. Water is readily got at the brook.

The *Nokue Passage* is more open and deeper (17 to 25 fathoms) than the Alcmène Entrance. On its N.W. side is an isolated shoal and islet, *Infernal Islet*. It may be entered by bringing the Nga Peak to bear N.E. ¼ N.

There is another passage to these anchorages from the north-eastward, by using the *Nokanhui Channel*, between the S.E. reef and the Isle of Pines. In its narrowest part it is two-thirds of a mile wide, and its least depth is 6 and 7 fathoms. The tides run very slowly through it, and with the westerly flood there is a tremendous sea in it with S.W. winds. When the S.E. winds are settled, there is no swell in any part, but there the current is so violent that it needs a very fresh breeze to enable a ship to clear it. For these reasons it is unadvisable for small vessels or steamers of moderate power to use it.

At about 1½ mile S.W. of the peak is *Kuto Peninsula*, where are the headquarters of the French establishments on the Isle of Pines. The political prisoners, about 2,000 in number, are placed at different stations on the West side of the island.

A black ball *beacon* has been placed on the North point of Kuto Reef.

Torch Bank, a sounding obtained by Lieut. Chimmo in that vessel, lies 8 miles S.E. by E. of the southern islet of the S.E. isles, and 17½ miles S.E. by E. from the peak, which bearing will be a guide for it. The depth obtained was 20 fathoms, coral bottom. The latter fact may be taken as a probability of the depths being less and decreasing.

Pine Islet (*Gie*) is the northernmost of a cluster lying off the North end of the Isle of Pines, and stands midway in the entrance to an anchorage on the East side, and others on the West side of the island. It is covered with the remarkable pine-trees.

Gadji, the residence of the principal chief, is on the main island to the South of this cluster. *Gadji Anchorage*, on the N.E. side of the Isle of Pines, is protected from seaward by the Barrier Reef, nearly 2 miles off shore, and has a depth of 10 to 20 fathoms all over it. There is an entrance to the S.E., and another from the North, keeping the peak S.E. by S. ⅔ S., leaving Pine Islet on the port hand, and the coral reefs and sand-banks of the Barrier Reef to the

eastward. The entrance and anchorage itself is free, as far as is known, from coral patches.

Uamæo Bay, or *Port Victoria*, is on the West side of the island, the first being its native name on the French chart, the second that given by Sir Edward Belcher, in 1840. It is surrounded by the low coral reefs, forming an area of about 6 miles by 4 miles, with several entrances on either side. As may be supposed, this space, although in quiet weather it may be protected from the swell, yet it is an exposed place to the prevalent wind.

If bound to Victoria Harbour, get the peak to bear about South, then steer for it, and when within a mile of the reef, bear away to the westward, keeping it close aboard. So soon as it terminates you will see the small island, Pine Islet, bearing from you about South; that island forms the West side. The channel is not above 200 yards wide, and the course in is about South; borrow on the sand-bank side, as a coral ledge runs from Pine Island some distance.

After getting inside, steer for a small rocky islet which you will seen on your port bow; leave it on your port hand, and anchor between it and the main in 3 to 5 fathoms, coral and sand.

If the wind will not allow a vessel to lay through the small channel, she will require to run down along the reef for the large entrance. It is half a mile wide, and the peak bears S.E. from it. In working in, keep a good look-out for a large coral patch which lies a little inside the entrance; leave it on the starboard hand, and work up inside the reef for Victoria Harbour, keeping a good lookout from the mast-head for coral patches, of which there are several. In working a ship amongst coral reefs, a careful and experienced officer ought always to be at the topmast head. All dangers can be seen from aloft when the sun is not ahead.

Captain Cheyne says that the sandal-wood tree was found on the Isle of Pines, as well as fine timber trees. The sandal-wood is the heart of the larger trunks of the tree, of a deep yellow colour, and of a most agreeable perfume. Clumps of tall pine trees grown on many parts of the island, and especially near the sea, and on the smaller outlying islets. They are not fit for spars generally, though very tall, and are very remarkable at a distance, resembling the masts of an immense fleet of shipping.

The character of the natives of the Isle of Pines has undergone much change for the better since their first intercourse with the sandal-wood traders in 1841. At that time, like their neighbours, they were treacherous cannibals, and cut off some vessels. But they are now so much civilized as to render it safe for a white man to walk unarmed all over the island; they are about 800 in number. The Roman Catholic Mission, as was said before, is at the South Harbour, Port Vao.

The Botany Isles of Cook are some small islets, two of which have pine trees, scattered over the line of reefs which extend from the Isle of Pines to

Cape Queen Charlotte, the S.E. extremity of New Caledonia. These reefs have several channels through them, which the deficiency of any landmarks renders difficult of explanation. The chart must be the best and only guide, except the eye, and the usual caution amongst these dangerous reefs. The widest and deepest channel, the *Sarcelle* (or *Teal*) *Passage* of the French survey, is nearly midway between the two islands, and is more than 2 miles wide in its narrowest part, with 34 to 40 fathoms water. Its direction is to the S.W.

To the N.W. of this passage, encircled by reefs, is Cook's Anchorage, called *Améré* in the French charts, and the island named by him, which is low and sandy, about three-quarters of a mile in circuit, covered with tall pines, and a variety of other trees, shrubs, and plants, is on the South side of the anchorage. It is also called Améré in the survey, and has a safe channel on either side of it. *Ietendi Passage* is separated from Sarcelle Passage by a narrow coral reef, and, though narrow, is deep, and leads into the anchorage, and to the westward.

CAPE QUEEN CHARLOTTE, of Cook, is not a projecting headland, as represented on the old charts, but is only the bluff S.E. termination of New Caledonia, beyond which is some low land, and a projecting reef, which forms the port of Goro and Kueboni. *Port Goro* (or *Cascades*) is entered from the South by two passes through the reef, and is well sheltered from the swell, but open to the wind.

To the S.W. of it the coast runs for 6 miles to *Cape Ndua*, the bluff South point of New Caledonia, and perhaps the Cape Prince of Wales of Cook. About midway is *Port Kue*, a narrow creek open to the South, and *Wooded Port*, a land-locked basin, entered by a narrow passage through the reef.

Havannah Passage, named from the ship, passes along the S.E. end of New Caledonia, the fairway through being with Cape Ndua bearing S.W. by W. On its South side is *Kie Island*, which, with Améré Island, are the only ones covered with the remarkable pines on the southern reefs, and will serve as marks for them. On the North side, and projecting from the eastern reef of Port Goro, is a bank of $4\frac{3}{4}$ fathoms, which adds to the violence of the currents which run through the passage. At times, during an hour at the change of spring tides, they form a bore or mascaret, where the whole passage is barred by a continuous line of breakers. It would not be prudent to attempt it at this period, but a short time afterwards the streams resume their ordinary condition. On some charts a line of coral reefs is marked to the N.E. of the entrance.

Roche du Var is a dangerous sunken rock, having only 6 ft. water, in lat. 22° 14′ 25″ S., long. 167° 10′ 15″ E., $7\frac{1}{4}$ miles N.E. by N. from the entrance to Havannah Passage. From the rock a peak on the mainland of New Caledonia is in line with the South extreme of Nau Island, bearing W.S.W., and the South extreme of Cape Ndua bears S.W. $\frac{1}{4}$ S.

The area South of Cape Ndua is strewed with coral reefs, which can only be

understood by an inspection of the chart. On two of them are islands, *Nuare*, low and bushy, at 3½ miles S.W. by S. of Kie Island, on the South of Havannah Passage, and E. by S. 5 miles from Cape Ndua. The other, *Ugo*, is 2¾ miles S. by E. from Cape Ndua. A beacon is placed on *Hydrography Shoal*, of 2¼ fathoms, 1½ mile N.W. ¾ W. of Ugo. No written description will enable a ship to avoid these reefs.

Praslin Bay.—From Cape Ndua to the N.E. point of Uen Island is 5 miles, and this is the South entrance point of Woodin Passage. Opposite it is *Pine Point*, half a mile distant, 3¼ cables S.E. of which is *Moziman Shoal*, marked by a beacon. Separated from Pine Point to the eastward by a very narrow channel is Montravel Island, a mile long East and West, which forms the West entrance point of *Praslin* or *Prony Bay*. Just round the eastern entrance point of this bay, off which a reef extends a short distance, marked by a beacon on its extremity, is *Good Cove*, where H.M.S. *Curaçoa* stayed for two days in 1865, and found good anchorage in 20 fathoms. A few natives were seen, and a missionary came off in a boat to ask if a pilot was wanted. Praslin Bay has been thoroughly examined; it is very extensive, and has in it abundance of fish.

Its shores are inhabited and well wooded. In general the coasts are high and steep-to. There is good depth and good holding ground throughout. Many rivers enter this bay, forming cascades, of which, one in the N.E. is remarkable. A mile northward of Montravel Island is Casey Island, covered with pine trees; S.E. of this island the holding ground is not good. Two detached 6-feet dangers exist in the bay, one about a mile true West of Casey Isle in the West Road, and about 2 cables off a pine-covered point; another 1½ mile N. by W. from the West end of Casey Isle, with the West end of that island and the West end of Montravel in line, about midway between two projecting points This is on the northern side of the *Grande Rade*. It is high water, on full and change, at $8^h\ 10^m$.

Woodin Passage, the *Constantine Strait* of M. Tardy de Montravel, insulates the S.W. point of New Caledonia, Uen Island being formerly considered part of the main land. It was first passed through by Capt. Woodin, in the barque *Eleanor*, in 1847, who also passed through the Havannah Channel at the same time. Capt. Woodin gives a sad picture of the cruelties and atrocities of the natives.

Woodin Channel is safe and clear throughout, no detached dangers, and deep water 10 to 20 fathoms close to the shores. It is about 14 miles in extent, and its East entrance is taken with *Ia Peak*, a rugged mountain, 1,624 ft. high, at the S.W. point of New Caledonia, bearing W. ½ N. From its West entrance there is a clear passage to sea through the Bulari entrance, 20 miles to the S.W., or to the Port de France to the westward.

The best passage from the North end of Uen Island to Port Nouméa is called Tareti Passage. A vessel should pass North of Tareti Island or sand-bank, and South of Nakae Shoals. These, together with Four Northern Banks

on the South side of the channel, always show above water. From abreast of Four Northern Banks steer to pass between Mando and Maitre Islands. Tareti Passage is preferable to Porcupine Island Passage, as Oliver Bank and Provident Shoal are not always visible. They were not seen from the mast-head of the *Pearl* when the vessel passed near them. The beacons marking some of these dangers are noticed hereafter.

Several good anchorages exist between the western entrance of Woodin Passage and Nouméa, where a vessel could anchor for the night, or to await a change of wind or tide. The first of them is *Uié Bay*, having good holding ground and a mountain stream on its northern side. Vessels should not pass too far in towards the head of the bay, as the bottom becomes rocky and uneven. *N'go Bay*, 2 miles to the N.W., is a small port, well sheltered but sometimes difficult to leave for a sailing vessel. *Tareti Island* lies 7¾ miles S.E. by S. ½ S. from Mount D'Or, and has convenient anchorage a mile from its N.E. side, on sand bottom. Another anchorage is found on the East or West sides of Porcupine Islet.

Uen Island, or *Waima*, above spoken of, is 4½ miles from North to South, high, rugged, and deeply indented on its eastern side by *Port Kute*, clear and deep when once inside, but the entrance to which is past several rocky patches. It is on the South side of the opening. There is a very narrow channel through the reefs to the South of it. There is a mission station on the island.

The *Great South-west Reef*, before mentioned (page 560), extends 35 miles to the southward of Uen Island. Its southern point being fixed by Captain Denham's survey as in 23° 1′ S. by 167° 3′ E. There are several entrances apparently through its outer edge, on the eastern side from Waakzamheyd Bay; but as there is but little inducement for attempting them, nothing more need be said here. From this South extremity its western face trends in a general N.W. by W. direction for 85 miles to Port St. Vincent, enclosing at a distance of from 5 to 20 miles, what is at present the most important portion of New Caledonia to Europeans, the French settlements near Bulari and Dumbea Bays.

MOUNT D'OR.—The most remarkable landmark on this part of the coast bears from Ia Peak, at the N.W. entrance of Woodin Channel, 11 miles to N.W. by W. ¾ W. Mount D'Or has a rounded top, surmounted by two small pinnacles or heads close together, and in some positions they are seen but as one. Its upper part is quite bare and of a reddish colour, unlike any other mountain in this part. It is quite detached from the interior chain, which is higher and more irregular. A fine cascade, 70 ft. high, falls into the sea from its side, at which watering is very easy by means of the ship's fire-engine pumps during fine weather, and with off-shore winds. This mountain once made out is an excellent guide to all the entrances and ports in its neighbourhood. It is 2,543 ft. high.

BULARI BAY (or *Morare*) is to the westward of Mount D'Or. It is here

that the French were first attracted by the beauty of the scenery and the fertility of the land, on their founding the colony in 1854. Its western side is formed by the peninsula which separates it from Nouméa or Port de France. It is open to the South between S.W. and S.E., and is 13 or 14 miles within the barrier reef. In its N.E. part an extensive plain which separates Mount D'Or from the principal chain opens upon the sea, and through it issue some streams by several branches, bringing down the alluvial matter, which has filled all the head of the bay. Immediately on the North flank of Mount D'Or are some *coal* deposits; there is also a mine of chrome at Mount D'Or, which is now being worked, 600 tons having been shipped by one vessel in December, 1881. This part of the bay is bounded on the S.E. by a steep rocky point, to the N.W. of which, half a mile distant, are some shoals. Within these latter, near to the shore, is good anchorage.

The S.E. point of the bay is formed by three or four islands, connected by shoal water, which stretch out 2½ miles from the foot of the mount, and which must have a good berth in rounding. The southern islet is covered with pines, and that nearest the point is of a remarkable wedge shape, with the steep end to the South, and surmounted by a small rounded peak. At a mile W.N.W. of this is *Caledonienne Shoal*, of 9 ft., but steep-to; it lies off the cascade before mentioned 1½ mile distant.

In the south-western part of the bay is *Mission Bay*, filled with mud banks, except along the edge of a coral reef, which almost encloses it, but having an opening between its West end and the point. On the western side of the bay is *Ngea Island*, which forms its S.W. limit. Between this island and the Ducos Peninsula is Port Ngea, entered from the southward only, and having a shoal of 13 ft. in its mouth. *Provident Shoal*, lying off the middle of the entrance to the bay, is marked by a beacon on its South side.

The whole circuit of Bulari Bay affords an excellent supply of wood, fit for ship-building or carpentering. Water may also be obtained from the streams and cascades, and coal of good, though untried quality, is found in several places.

The BULARI PASSAGES, by which the bay is approached through the barrier reef, lie with the summit of Mount D'Or, bearing N. by E. ½ E. 17 miles distant, in about lat. 22° 31′. There are several of them separated by coral patches, and the reef here runs about N.N.W. instead of its usual trend of W.N.W. on either side of it. They may also be recognized by a small islet on the outer reef, and another, *Amédée Islet*, within the reef, where pilots may be obtained.

The LIGHTHOUSE on Amédée Islet is one of the finest structures in the world.* It is a round iron tower, painted in red and white bands, 164 ft. high, and stands in lat. 22° 28′ 44″ S., long. 166° 28′ 40″ E. The light is *fixed bright*,

* That such a lighthouse should be placed in this remote and almost unknown region, is a grand tribute to the importance of these structures.

elevated 150 ft. above the sea level, and visible all round the horizon to a distance of 20 miles.

A *fixed red leading* light, elevated 47 ft., and visible 5 miles, is shown on Amédée Islet from an iron column, 20 ft. high, on a white octagonal stone base 29 ft. above low water. This light, kept in line with the bright light, N.E. ½ N., leads in mid-channel through the northern Bulari passage. To keep in the deepest water, keep the red light open a little northward of the bright light, and with a heavy sea do not open it to the southward of the bright light.

Amede'e Islet is of sand, covered with low bushes. It lies within the madrepore reef, which encircles New Caledonia, and its lighthouse serves as a grand mark for the Bulari Passages, which are to the South of Nouméa.

By day, to enter the *northernmost* pass, which is 200 yards wide, and 2 miles *S.* 48° *W. true* from the lighthouse, bring the lighthouse to bear *N.* 48° *E. true*, and then steer for it; when within the entrance keep a little to starboard to avoid the point of the Great Reef, which is left to port, then keep close to the reef, which is awash, and which is 1 mile N. by E. from the pass, passing it at a cable's length to East or West. After this, bear to the northward, so as to bring the centre of the wooded *Maitre Islet* to West; then place the head N.W., so as to pass between it and the small islet *Mando* or *Aux Canards*, also wooded. When in the middle of the channel formed by these two small islands, steer toward the North end of *Brun Island*, which is left to starboard, and then enter the passage of the road of Nouméa.

A beacon is placed on the N,W. side of *Amédée Shoal*, about half a mile westward of Amédée Island, and another on *Thisbe Shoal*, the westernmost of the *Four Western Banks*, about 4 miles northward of Bulari Passage. Another is placed in 6 ft., near the N.W. patch of the *Four Northern Banks*, and another in 1 foot of water on the eastern point of the reef extending off Maitre Islet. *Garnault Rock*, with 9 ft. over it, and steep-to, lies 2½ miles E. by S. ½ S. from the North extreme of Goëlands Island.

In approaching the Bulari Passages in clear weather, the light may be seen from an elevation of 40 ft. at a distance of 22 miles. As soon as it comes in sight from this height on the magnetic bearings below stated, the ship will be distant from the reef ahead of her the number of miles placed beneath that bearing:—

N.W.	N.N.W.	N.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.
10½	15½	16¾	19	20	19¼	17	5½
1¼	9½	16	17½	18½	14½	9	2

But the shortest distance between the ship and the *nearest part of the reef* (which trends S.E. by E. and N.W. by W.) will be about as the second line of figures in miles.

Consequently, when a ship in clear weather sees the light to N.E. she is 20

miles from the reef itself, and 18½ miles from the nearest part of the reef. It is therefore recommended that the light should be made between N.N.E. and E. by N.

NOUMEA,* or Port de France, the principal French establishment in the Western Pacific, was founded by the late Captain Tardy de Montravel, in the *Constantine* and *Phoque*, in 1854. It lies on the West side of the Ducos Peninsula, within Du Bouzet Island. The first task was to erect a fortification for the protection of the small military colony, who were the pioneers of the settlement. In 1871 the town consisted of about 300 houses, including a hospital; the population amounted to 7,000 or 8,000 in 1883. The water supply is bad, and this, together with the barrenness of the land immediately surrounding, is a great drawback to the progress of the town. One of the first objects seen in approaching is the semaphore for signalling the approach of vessels, situated at the back of the town. There is a small jetty, large enough for the use of coasting vessels, but a quay of considerable length is now being built. In 1881, 127 vessels entered this port, of which 101, with a tonnage of about 32,000 were British.† Provisions are scarce and dear. H.M.S. *Rosario* was here in January, 1872, and procured coal at 50 francs per ton. A condenser had at this time been established on shore, but the distilled water cost 25 francs per ton.

Light.—When the moon is not visible a *fixed red* light, visible 6 miles, is shown in front of the Harbour Master's house.

The fortifications occupy the North side of a small bay on the western side of the peninsula. On its South side is *Bayonnaise Cove*, which is being filled up, and the harbour is formed by the East end of Du Bouzet Island, which shelters a space of 1½ mile long by half a mile in width, having a depth of from 5 to 8 fathoms all over. There is a southern or Little Entrance to this harbour between the S.E. point of Du Bouzet, and a small island, *Debrun*, to the South of it; the latter is connected with the shore by shoal water. The N.E. point, too, of Du Bouzet, has a sort of bar, with 15 ft. water between it and the main.

Buoys.—A red buoy is moored off Diamond Point, and another on the end of the 13-ft. shoal abreast Bayonnaise Cove.

A buoy is moored in 3 fathoms, S.E. of Denouel Point, on the northern side of Little Entrance. Buoys have also been laid down upon the East and West sides of L'Infernal Bank. The least depth between the two buoys marking the channel between Picard Point and Dumuri is 16 ft.—*Annonces Hydrographiques*, 1883.

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* The name was changed by Imperial decree in March, 1866, from Port de France to the native name. This was done on account of its similarity to *Fort* de France, the capital of Martinique, which led to numerous and serious postal mistakes.

† Vessels flying any other than the French flag in these waters are liable to a tax of 1½ franc per ton for every voyage, besides extra light and pilotage dues.

Du Bouzet Island, or *Ile Nou*, on which is the chief convict establishment, is 2¾ miles in length W.N.W. and E.S.E. It is narrow and consists of a series of hills, of which two close together stand on its N.W. end. The next eastward to these is *Mount Io*, used as a mark for the entrance through the reef. The *Roadstead* lies between the North side of the island and a projection from the Ducos Peninsula, a space of 3 miles in length, East and West, by a mile in width, with deep water all over, and the shores bold-to. At its eastern end is the bar which separates it from the inner harbour, as above mentioned. A *telegraph* cable is laid in a S.W. direction from Kuauri Point, Ducos, to Ile Nou, and vessels are cautioned against anchoring in its vicinity.

Capt. De Montravel says :—What struck us all at first was the splendour of the harbour, which our boat had observed at the entrance of Nouméa (Dumbea) Bay. A harbour formed by a peninsula, which presents in its cleft several creeks, of themselves fit to receive ships, and by an island which runs parallel to the shore, and is separated from it by a channel 3 miles in length, and about a mile in mean breadth. This channel, which offers an anchorage in any part, sheltered from all winds, is divided into two parts by a bar, which cuts it at its narrowest part without entirely intercepting the communication from one to the other by ships drawing less than 16 ft. It possesses the invaluable advantage of having two outlets, the one to the East, the other to the West, of the island, which serves it as a defence towards the sea. It is, in short, impossible to see anything more complete than this harbour, of which every advantage will be evident at a glance on our survey. Complete security is there first evident, facility of defence and easy appropriation to any kind of establishment, convenient ingress and egress with all winds. I confess that, with every one near me, I was lost in admiration at so many advantages united in a single spot. I thought I could not give a better name than Port de France to this valuable discovery.

Dumbea or Jitema Passage, through the encircling reef, lies abreast of the Port de France, and is a safe and excellent entrance. It is one of those rare interruptions to the continuity of the coral reef, and is 13 miles W.N.W. from the Bulari Passage, the *Great Abore Reef* being straight and continuous between them. The ensuing remarks on it and the route within are by M.M. Senez and Laregnère, who, under Captain De Montravel, first examined it, but they were written before the lighthouse was erected. The names, bearings, and other particulars, have been corrected by the later and more complete surveys made by the French Government.

The opening is nearly three-quarters of a mile in width, in lat. 22° 21½′ S., long. 166° 16¼′ E. It is quite free from danger, and the depth in it is from 50 fathoms in the entrance to 13 and 14 fathoms on its inner side. These depths are found close to the reef on either side, but on the South side there is a small coral patch, projecting 200 yards, on which the depth suddenly diminishes from 20 to 6½ fathoms. This spot is useful for anchoring in case

the ship is overtaken by a calm, or being drifted out of the course by the current. Daring our stay here the current was almost always to the West from half to 1 mile per hour, being only modified by strong breezes from the southern quarter, during which it runs to N.W. and N.N.W., with a rate of 2 miles an hour, which makes it more dangerous, as there is no anchorage on the North side.

Several times we encountered a singular turbulent sea in the entrance, as had been felt in that of St. Vincent, which could not be accounted for. The sea rolled in a most singular manner, rolled over and broke so violently that the cable was obliged to be slipped to prevent being swamped. For this reason, which must be guarded against, it is best to keep on the South side of the pass at 1 or 2 cables' lengths from the reef.

Dumbea Passage is very clearly distinguished from others by two wooded islets, one bearing N. by E. ¾ E., the other N.E. ½ E. from the middle of the entrance, each distant 4 miles from the pass, and 2½ miles apart. There are no others of the same sort within the reef in this portion of the barrier. The first, or northernmost, *Senez*, or *Te Ndu*, covered with a tufted vegetation, can be seen 2 or 3 miles outside. It stands on a coral bank, in the N.W. of which is an entrance for boats. The other islet, *Laregnère*, or *Nge*, is smaller, its vegetation less vigorous, is not very remarkable, and cannot be seen very far off.

Besides these islets, a bearing of Mount D'Or is one of the best means of making the passage out; it bears from it N.E. by E. ½ E. Besides this bearing, those more recently given are the double peak of Mount Kogi (3,537 feet), to the N.W. of Mount D'Or, in one with the little Mount Io, on the West end of Du Bouzet Island, bearing N.E. ½ N. Or of Freycinet Island, which is not very clearly distinguishable by a stranger, but lies to the N.W. of Du Bouzet Island; it is a small, round, and wooded islet, of a dark colour, should bear N.E. by N. ¼ N., and this bearing is the best for leading up to the North entrance between the dangers within the reef.

The first of these is a coral patch lying on the second leading mark or N.E. of the middle of the entrance, and should be left to starboard, passing nearer to the pyramid on Te Ndu Islet on the port hand. The next is *Senez Reef* bearing E. by N. about 2 miles from the pyramid, which is nearly awash, but seldom shows, and was therefore the more dangerous; it is now marked by a beacon. The next is *Prony Reef*, which bears N.E. ¾ N. from the pyramid 2¾ miles distant, and must also be left to port. These reefs are best seen and avoided by a look-out from aloft. In 1878 a sunken rock was reported to lie about 2½ miles W. ½ S. from Croey Island, E. by N. of Dumbea Passage.

The coral dangers mentioned in the foregoing description, are the principal that require caution, either in entering Port de France by the southern or western entrances.

If it be required to pass from hence through the Woodin Channel, it is best

to steer or beat up toward Du Bouzet Island, and then take an easterly course, or vice versâ.

It is high water, on full and change, in the Port de France, at 8^h 25^m, springs rise 4 ft.

Noumea, or Dumbea Bay, is to the northward of Port de France, or rather the latter lies on the eastern side of the former. They are separated from Port Laguerre to the westward by a mass of high land, remarkable from two high summits, whose southern face runs about N.N.W. and S.S.E. They are called *Gere*, elevated 1,266 ft., and stand on the *Mestro Peninsula*. The bay affords no anchorage, except in its unsheltered space, the upper portions throughout being filled with shoals and sandbanks, formed by the matter brought down by the rivers falling into it. On its North shore is the village of *Gadji*, where lived a powerful chief. In the interior to the northward are some *coal* deposits, which at some time may become important. They lie up the river, running into Port Laguerre to the westward.

On the western side of the bay is a small creek or harbour with anchorage, at the head of which is the most permanent spring to be found in the vicinity, the want of water at all seasons being an important drawback to Port de France. This spring, on the other hand, was found to be abundant after a long drought of 40 days.

Port Laguerre lies to the westward of the Mestro Peninsula, and 7 miles from the Port de France. It is sheltered from the S.W. by *Jeanne d'Arc Islet* (*Te Ndu*). From the South point of this a coral bank projects for three-quarters of a mile to the S.E., which does not always break, but is marked by the change in the colour of the water. Its outer extremity is due South of the point which separates the mouths of the two rivers which enter the bay from the N.E. and N.W.

It is about a mile in diameter, and has good anchorage all over. The best is in the triangle formed by the three points of the two rivers in $5\frac{1}{2}$ fathoms. The principal river coming from the N.E. crosses a wide plain from the interior, and near the shore covered with mangroves, forming an inner basin to Port Laguerre, but is of little depth, 3 to 5 ft.; but there is a deeper channel through which the streams pass. The upper branches of this river lead to the excellent *coal mines* before mentioned. This bay, like Nouméa Bay and the Port de France, is readily arrived at by the Nouméa Passage, using the precaution to avoid the coral patches indicated before, and shown on the chart, which is indispensable to a stranger, unless carefully conned from the mast-head.

Uitoe Passage, in lat. 22° 10′ S., is another opening in the reef, which is continuous from the Nouméa Passage, 14 miles to the S.E. $\frac{1}{2}$ E. The coast within it, to the north-westward of Port Laguerre, is lower, and the high lands lie some distance inland. The principal mark is a sugar-loaf hill, *Karikate Peak* (768 ft.), which bears N.E. $\frac{1}{2}$ N. from the entrance. It is a sharp, conical, bare peak, without verdure, except at the summit, where it is crowned

with bushes, which clearly distinguishes it. It is 7 miles from Port Laguerre, and at 2½ miles eastward of it is another sharp-pointed conical hill, the *Titema Summit* (1,174 ft.). This last brought in one with the table-topped Mu Mountain (4,000 ft.), bearing N.E. ¾ E., leads through the passage, which has 14 fathoms water. Just to the northward of the fairway, in the eastern part of the passage, is a sand and coral shoal, with 26 ft. least water, about 4 cables long East and West, and 2¾ cables wide; breakers have been seen on it with a south-westerly swell.

Port Uitoe, a basin sheltered by a line of low islands, lies to the N.W. of the Karikate Peak, and affords a large and well sheltered anchorage.

PORT ST. VINCENT, the next important place to the N.W. was so named by Capt. Kent, in 1793. It was overlooked by D'Entrecasteaux, who marked it on his chart as Havre Trompeur.

Mathieu Island, in its S.W. part, lies westward of Port Uitoe, and may be known by a hill on its West side, which falls nearly perpendicularly into the sea. Between this bluff and two or three small islets is the southern entrance to the port from the Uitoe entrance.

The port is chiefly sheltered by three islands, which lie in a N.N.W. and S.S.E. direction for 8 miles, leaving channels between them. The southernmost is *Hugon*, of the French, 3¼ miles long. It is steep-to on its East and West sides; but its northern side, the shortest, is fronted by a coral and sandy strand. There are some springs at 800 yards southward from its North point. *Governor King* or *Ducos Island* is the largest of the islands, and used by the French government as a convict settlement for political prisoners. It resembles a bat with extended wings. Its eastern point is a peninsula, joined by a low sandy neck, which forms two excellent well sheltered bays on each side of it. That to the S.E. is protected partly by Hugon Island; there is a shallow passage between these two islands. There is a beacon on the reef between Ducos and Parseval Islands, and another on the reef off the bay on the East side of Ducos Island. The bay on the North side of Ducos Island is nearly a mile deep, and 750 yards wide, with a depth of 5 to 3 fathoms. It makes an excellent land-locked basin, where a vessel can heave down or careen at all times or seasons. Off its entrance is *Marceau Island*, on which the observations were taken, placing it in lat. 22° 0′ 10″ S., long. 166° 5′ 0″ E.; high water, on full and change, at $5^h\ 50^m$; rise 4½ feet.

The N.E. point of Ducos Island is called *Arche d'Alliance Point*, after the French missionary vessel, and between it and the steep eastern end of the rugged *Colonel Paterson* or *Le Prédour Island*, is the principal entrance to the port. It is not more than one-third of a mile in width, but has deep water. Within this entrance the harbour extends to the eastward along the North side of Governor King Island, but all its area, near the land, and also the same with the *Gulf of St. Denis* to the eastward, is shoal water. The chart must furnish further instructions.

Lieut. Ravel informed the French government, in 1877, that *Cher Reef*, with 7 ft. on it at low water, lies about 2½ cables West of the Iles des Morts.

St. Vincent Passage, through the outer reef, is 4 miles S.W. ½ W. from the entrance between the two islands last mentioned. It is wide and deep, and may be known by a sandy islet (*Tenia*), covered with shrubs and vegetation, which stands on the *outer* reef at a mile N.W. from the passage. It is subject to the ground swell or boiling sea mentioned as occurring in Dumbea Passage. The entrance is in lat. 22° 2′ S., long. 165° 58½′ E.

Uarai Passage is in lat. 21° 51′ 30″ S., long. 165° 44′ 30″ E., and may be known by a sandy islet, with some bushes on the reef, about a mile from the South side. A mountain, Mount Unio, with a table summit rather sloping to the South, when brought to bear North, leads up to it. When made out, steer through towards *Lebris Island*, like a large hill on the main, leaving it to starboard. There is sufficient depth for anchorage, and there is also a passage within the reef to Port St. Vincent. *Isie Passage* is another opening through the reef in lat. 21° 53½′ S., 3 miles to the south-eastward of Uarai Passage.

Two *black buoys* are moored near the edge of the reef on the western side of Uarai Passage, about 1¼ mile apart; the northern one lies about 1¼ mile westward of Lebris Island. Ndigoro Island and the two buoys are in line with each other. Approaching Port Uarai from seaward, the buoys must be kept on the port side, and vessels coming from the southward, though the channel inside the reef, should pass between the beacon on the S.W. extremity of the reef extending southward of Lebris Island and the southern buoy, about 4½ cables apart.

At 6½ miles W. by N. ½ N. from Uarai Passage is a narrow but deep passage through the reef, named *Mara Cut*, leading to *Muendu Bay* to the northward, but the area of deep water within is very small.

Burai Passage, in lat. 21° 39′ S., may be known by the long, low, sandy island, which is inside the reef. The pass is very broad, and in a deep recess of the reef. In entering there will be seen some fine clumps of pine trees, one among others, at the foot of which is a white sandy beach. The pass runs North and South, and there is good anchorage within, the best to the S.E., where there is a fine river. There is a biche-de-mer establishment to the N.W. It is a good anchorage at all seasons, and the lands appear to be well cultivated. The bight is about 3 miles deep.

Cape Goulvain, in lat. 21° 33′ S., is a prominent headland, so named by D'Entrecasteaux, but of which we know little more. The reef here is closer to the mainland.

Contrariétés or *Porondu Island* is a sand-bank covered with bushes, and is about 11 miles beyond Cape Goulvain; the reef, which reaches only from 1¼ to 2½ miles off the latter place, here runs farther off the land; and at 7½ miles beyond this island is *Mouéo Passage.*

Port Moueo.—The entrance lies in a W. by. S. and E. by N. direction, thence gradually turning to the northward. This bight is about 6 miles deep, and has anchorage near its head in 5 or 6 fathoms, mud, about three-quarters of a mile northward of Grimoult Island, off the North side of which a 9-ft. patch exists, which must be avoided. In the bay were some houses of European fishermen, near two small rivers. The pass is in lat. 21° 23′ 45″ S., long. 164° 57′ E.

Port Mouéo was surveyed by Capt. Chambeyron, French Navy, in 1876, and it has since had beacons placed as leading marks.

The beacon on Béco peninsula kept in line with the South point of Didot Island, bearing N.E. by E. ½ E., leads through Mouéo Pass. When within the South point of the reefs, keep Béco beacon in line with a cut in the mountains, and after passing the 8-ft. patch, which is always visible and lies just within the southern reef, steer to pass about one-third of a cable North of the South beacon, and when the beacon on Ié Island opens of the S.E. extreme of Grimoult Island, steer with these in line, bearing about N.E. ¼ N., until the beacon on Nepoui is in line with the West extreme of Grimoult Island; keep the latter marks on until the three South points of Grimoult Island come in line; when alter course to pass 1 cable West of the perch upon Grimoult Reef, and from thence to the anchorage off the South point of Nepoui.—*Annonces Hydrographiques*, 1881.

Puembut Passage is in lat. 21° 14′ S., a mile broad, and has a reef in its centre, to the southward of which is the best channel. Inside the channel extends 3 miles to the north-eastward, and thence 8 miles to the northward between the reefs, where it joins Koné Passage. There is anchorage in 3 fathoms under the western side of an island lying a mile south-westward of Puembut River, 7 miles up the channel, which is a mile wide up to this point, with a least depth of 4½ fathoms. *Koné Passage*, 7 miles to the northward of Puembut Passage, is about half a mile wide in its entrance, and extends 5 miles to N.E. by E., having anchorage in 2¾ fathoms near its head, but the least depth in the channel is 2½ fathoms, about 2 miles from the entrance.

Duroc Pass is in lat. 21° S., and there is a passage from hence within the reef, through which the French vessel of that name came from the North end of the island, but it is intricate and difficult. *Pouaco Village* lies about 4 miles within the entrance, and about 1½ mile south-eastward of it is a good anchorage in 6 to 7 fathoms. Opposite the village the channel is 2 miles broad, narrowing rapidly to one-third of a mile broad 4 miles to the westward. About 2 miles to the westward of Pouaco the French corvette *Infernét* touched on a mud bank, with 16 ft. water over it, in mid-channel.

Alliance Cut, the next entrance to the northward through the reef, lies in lat. 20° 57′ S. It is very narrow. The succeeding part of the reef is known as *Great Matthieu Reef*, and its S.W. part, was stated, in 1877, to project 2 miles more to seaward, in lat. 20° 50′ 10″ S., than shown on the chart.

Between lats. 20° 45½′ and 20° 41′ is an opening through the reef, having its centre blocked up by a reef 3 miles long, on the North and South sides of which is a navigable channel, that to the northward called *Koumac Passage*, and that to the southward *Deverd Passage*, the latter of which runs in an East direction towards *Cape Deverd*, a headland, in lat. 20° 45′ S., the South point of *Gomen Bay*, and remarkable for a pointed summit on the mass of hills which compose it. There is a settlement here. There is anchorage under the North side of this headland, and a clear and wide channel up to it 8 miles long from Deverd entrance. The *Infernét* discovered two sunken rocks at about 1⅛ and 1¾ mile N.W. ½ N. of Kendec Islet inside Koumac Passage; the southern rock of 8 ft. is marked by a *beacon*, the other has 19 ft. over it. A small detached reef, 1⅛ mile S.E. of Kendec Island is also marked by a beacon.

Great Koumac Reef extends from Koumac Passage for 23½ miles in a northwesterly direction without an opening through it. Abreast it on the coast lies the lofty *Mount Kâála*, in lat. 20° 37′ S., and *The Dome*, a peak 2,000 ft. high, in lat. 20° 27′ S. In 20° 23½′ S. is *Gazelle Passage*, leading into Néhoué Bay. Cape Tonnerre bears E. ¾ N. 10 miles from this entrance, and 5 miles N.W. by W. ½ W. from Dome Mountain. It is about 350 ft. high. Behind it is a plateau with two summits, forming a well-marked table land 800 or 1,000 ft. high.

Nehoue′ Bay.—From the Gazelle Passage an E. by N. course for 5 miles will lead up to between the low patches of reef called Isle Ouanne, on the North, and Tiambouène Isle on the South, which leave a channel 2 or 3 miles wide between them. From this position the entrance of Néhoué Bay will be about 3 or 4 miles to the N.E. by E. It is 3 miles wide, and has three islets in its entrance, which have ample water between them for any vessel. The best anchorage in Néhoué Bay is in its southern part, in 5 fathoms, at 2 cables eastward of the largest islet lying off the northern end of Cape Tonnerre Peninsula, and 2 cables northward of a reef under water, which is always visible. To gain this anchorage with the prevalent S.E. wind, several tacks will have to made in the bay, and care must be taken not to get too far to the eastward, by not bringing the western high land of Cape Tonnerre to bear southward of S. by E.

Tanlé Bay, 2 miles wide, is separated from Néhoué Bay by Boh Island. Its N.W. side is formed by Poume Peninsula. The anchorage of Tanlé Bay is sheltered from the southward by Tanlé Island, lying westward of Boh Island. Bonn'mahame Reef, westward of Tanlé Island, forms the southern side of the entrance; and, in entering, the northern side of this reef must be carefully avoided. The anchorage, in 4 fathoms, is northward of Observatory Hill at the eastern end of Tanlé Island, and affords security in the worst weather. Another anchorage, more easily attained, is off the middle of Tanlé Island, with Maaboun'ghi Islet bearing W. by S., in 6 fathoms. A stream of water

runs into Tanlé Bay from the high land of Poume Peninsula, but it is a difficult watering place, as the prevalent winds make boat landing dangerous. It is high water at Tanlé, on full and change, at $8^h\ 4^m$; springs rise 5 ft. From the northern side of Tanlé Bay the high land of Poume Peninsula extends for 4½ miles to to the north-westward to Poume Point. Its central and highest point reaching 1,468 ft. elevation.

Poume Pass, in lat. 20° 15′ S., is 7 miles westward of Poume Point; it is 1½ mile wide, and may be entered by keeping that point or the pointed summit just northward of it, bearing E. by N. Great care is required in entering this passage, as the tides run strongly, the flood E. by S. 2 knots; the ebb W. by N. Within the reef the tide runs at the rate of 3 knots, flood to the southward, ebb to the northward.

Banaré Bay lies between Poume Peninsula and Bouabon'de Peninsula, 5 miles to the northward. It has islands and anchorages in it. Off it lies *Néba Island*, 2 miles long, N.W. and S.E., and moderately high. Its southern end is 5½ miles N.W. of Poume Point. There is a village on its western side, and anchorage half a mile off it in 8 or 9 fathoms, sand. At 2 miles S. ½ W. of its S.E. extremity, is a 2-fathoms patch of coral, and a coral patch of 4 fathoms lies W.N.W. 3 miles from its N.W. end, and nearly midway between it and *Yandé Island*.

Yandé or *Yendi Pass*, a little more than a mile wide, has its centre in lat. 20° 5′ S., long. 163° 46½′ E. It is entered by keeping the summit of Yandé Island (1,070 ft.) bearing N.E. by N. As in Poume Pass, great caution must be used on account of the tides, which at time of change produce a sort of bore. The flood runs to the eastward, and ebb westward, at the rate of 3 knots. There is a temporary anchorage off the N.W. side of Yandé Island.

Eastward of Yandé Island lies Paaba Island at a distance of 7½ miles. This island is inhabited by the Nenena tribe—infamous for the massacre of some of the crew of the *Alcmène*, and the unfortunate De Varenne. It is 5 miles long, North and South, and has islets extending a distance of 3 miles off its N.W. side. *Tiou*, the northernmost, is of small extent, but offers shelter either South or West of it. There is no passage apparently, even for a boat, among the Paaba Group. Rounding these islets the distance along the eastern shore of the main land is about 23 miles into Harcourt Bay. It is only navigable by the chart or a good pilot. Harcourt Bay, and the channels leading into it from the eastward, are described hereafter.

Belep Isles, to the north-westward, consist of five islands and some rocks. In approaching them from the southward, the depth of water varies considerably. It was supposed that there was anchorage among them from ordinary gales. The *Three Sisters Rocks*, the southernmost of the Bélep group, are 13 miles W. by N. of Tiou, with an apparently clear and deep channel between; between these and the South end of Art Island, 7 miles to the

N.N.W. are several small islands of which *Niénane* is the largest. *Art Island* is 11 miles long N.W. and S.E., and at its N.W. end is *Aue Anchorage*, about a mile in width, with 8 to 12 fathoms, sheltered on the West by two large patches of reef. A deep passage, about 1¼ mile wide, separates Art Island from *Pott Island*, next to the N.W., which is 4 miles long N.W. and S.E. To the N.W. of this lies a small islet, and *Lebert Island*, the northernmost of the group.

D'ENTRECASTEAUX REEF.—An immense range of dangers extends for 150 miles N.W. of the North extreme of New Caledonia, but it is probably separated into distinct portions. The northernmost, called D'Entrecasteaux Reefs, were discovered by Capt Bond, in the *Royal Admiral*, in 1792. In the same year the French Admiral also sailed along them, and thinking he had doubled their North end, discovered the small island, which he called Surprise Island. They were partially examined by Lieut. W. Chimmo, in the *Torch*, when he went to relieve the surviving remainder of the crew of the ship *Ningpo*, which had been wrecked on them in July, 1854.

They have of late years come into notice on account of the guano deposits on Huon Islands, which were visited in 1877 by the French war-vessel *Le Curieux*, when it was estimated that there were about 300,000 tons of guano in the deposits on the three southern islands, very little being found on North Huon, and the most on Middle Huon. From these visits, with later particulars, and information kindly given us by Capt. J. M. Richardson, of the barque *Golden Russet*, 1879, the following description is drawn up.

This dangerous and extensive reef, N.W. of New Caledonia, occupying a space of nearly 1,000 square miles, consists principally of two sunken barrier reefs, about 10 miles apart, each enclosing a lagoon, with only a few small islets and large rocks or stones on their margins. The northern, about 16 miles in length North and South, is pear-shaped, tapering to a point at its North end, where there are three remarkable rocks, 15 to 20 ft. high, the highest much resembling a boat's lug sail. Reefs are said to exist about 4 miles eastward of the N.E. side of the reef. The southern is about 31 miles in length E.N.E. and W.S.W., and on it are the principal islands of the Huon group, North Huon being the only island on the northern reef.

HUON ISLANDS consist of four small islands, of about 2 or 3 miles in circumference, viz., North Huon, Middle Huon, and South Huon, with Surprise Island at the South extreme; also a few small sand islets and the rocks above mentioned. The islands are entirely surrounded by a fringe reef, only passable for boats on their lee or N.W. side at high water, which makes it dangerous to cross, a heavy sea rolling over it. It is not safe to stay long here in the hurricane season, December to April. These islands are liable to great alterations by the hurricanes, which might easily wash away a part or the whole of an island.

North Huon Island, in lat. 18° 2′ S., lies on the central part of the eastern

side of the northern reef. It has a good and safe anchorage from easterly winds, but should be carefully approached, particularly by sailing vessels, having many sunken coral patches 2 or 3 miles W.S.W. and westward of it. There are three entrances through this reef, all on its western side, within a space of 4 miles. The northernmost is about 8 miles W.S.W. of the North end of the island. The anchorage should be approached by bringing the centre of the island to bear E.S.E., distant 5 or 6 miles, and steer for it, keeping (with the sun to the West) a good look-out for the small coral patches, awash and sunken, directly in the entrance, and distant 2 or 3 miles from the island. Gradual soundings, from 50 to 19 fathoms, will be carried to the anchorage. The landing is good, on a steep sandy beach, having 8 ft. water under the boat's stern when her bow is on the beach. The island abounds with turtle, fish, and sea birds, but no water.

Middle Huon, or *Leleizour Island*, is about 2 miles in length N.E. and S.W., by three-quarters of a mile wide, bordered with a fringe of reef and white sand beach. It is elevated about 12 ft., and covered with trees 20 ft. high. It is in about lat. 18° 18′ S., and abounds with turtle, sea-fowl, fish, and land-rail. It was here that the crew of the *Ningpo* lived for three months, but they found no water, although wells were dug 18 to 20 ft. deep. A mole has been built on its N.W. side out into deep water, for loading boats with the guano.

The *Louisa* anchored a quarter of a mile off shore, with the flagstaff bearing S. by E., in 6 fathoms, coral and rocky bottom. Anchorage may also be obtained about a mile from the shore, in from 14 to 20 fathoms, on the North side of the island.

South Huon, or *Fabre Island*, has also a fringe reef round it, and is still more dangerous of approach for boats than Middle Huon. It is very similar to Middle Huon, from which it bears W. by S. about 2½ miles, with a clear channel between. Coral reef surrounds it on all sides for a distance of about half a mile, and anchorage may be obtained on its N.W. side in 25 fathoms, about a mile off shore.

Surprise Island, so named by D'Entrecasteaux, when he thought he had weathered the North reef of New Caledonia, is about 11 miles S. ½ E. from Middle Huon, with a clear passage between. It is about 2 miles long East and West, by a mile wide, situated on a coral reef, covered with trees, and surrounded by a white sandy beach. The flagstaff on it stands in lat. 18° 31′S., long. 163° 8′ E. There is a well of brackish water in the middle of the island, always best at high water.

About 1½ mile North of Surprise Island is an isolated coral reef, about 2½ miles long, East and West, by three-quarters of a mile in breadth. On the North side of this reef, anchorage may be obtained in from 10 to 20 fathoms, at distances varying from 2½ cables to a mile from the reef.

Directions—Vessels bound to these islands from the southward should steer for the North end of New Caledonia, and then continue along the French

Reefs, which are generally distinctly visible, until abreast their northern end, which is marked by two black rocks appearing detached about 2 miles distant from the reef. From thence, steer northward towards Surprise Island, which is visible from a distance of 12 miles, and the West end of which can be rounded at the distance of about a mile. Inside D'Entrecasteaux Reef the sea is smooth, but as the tides run strong at times, it is well not to enter without a commanding breeze.

Should a vessel pass Surprise Island too late to reach Huon Islands during daylight, anchorage should be taken up near that island until the next morning. If unable to reach Surprise Island before dark, it is recommended to stand to seaward. If intending to stay at Huon Islands, vessels should moor, laying out the heaviest anchor to the S.E. The bottom, of coral and rocks, affords fair holding ground.

It is high water, on full and change, at Huon Islands, at about $5^h\ 40^m$; the rise is about 6 ft.

"Close westward of Surprise Island is a good and safe passage more than a mile wide, which leads in between the reefs to the anchorage. A narrow coral reef, a quarter of a mile long, N.E. and S.W., awash at high water, lies half a mile N.W. of Surprise Island; between this reef and the island is a good and safe passage and the anchorage. Here I remained seventy days, and loaded a cargo of guano, in the barque *Golden Russet*, in July, August, and September, 1879; the tide runs 1½ mile an hour at springs, and rises 4 ft. To reach this anchorage, a vessel, after entering the South passage, must work up round the small reef above mentioned, keeping a good look-out for a small coral patch 100 yards N.W. of the same reef, and come in to the anchorage from the N.E." —*Capt. J. M. Richardson.*

The NORTH-EAST COAST of New Caledonia trends in a general N.W. and S.E. direction for 210 miles. It has been more visited than the opposite side, and there are many sad tales to be related of the murderous propensities of the natives wreaked on the adventurous French missionaries and colonists, who had come hither with the humane endeavour of humanising these treacherous beings, or of developing the hidden but untried resources of their fine country. It has not been fully surveyed, and therefore the unconnected remarks which follow must be received accordingly. It should be remembered that, while possessing the same dangerous character as the other side from its barren reefs, it is a lee shore from the prevalent trade wind, and that the northern portion, as noticed before on page 560, is liable to the visitation of cyclones, to which the portions South of lat. 21½° do not appear to be liable. In navigating within the reefs, a man aloft should be kept on the look-out for dangers. The usual depth between the reef and the shore varies from 49 to 22 fathoms.

"The East coast of New Caledonia is mountainous and remarkably desolate. The hills, as a general rule, rise from the water's edge at a very steep inclination, rarely precipitous. The sides are usually covered with scrub and fern.

Where the soil has been washed away by the rains, traces of iron are seen. It is always in the neighbourhood of these deposits where the lodes of nickel are found, which threaten to open up this country. A mine is now working near Kanala."—*Australian Sketcher*, 1876.

Queen Charlotte Foreland, before noticed, is the S.E. extreme. This headland is fringed, as is usual, with the coral reef. and it may be said to be limited to the North by the little harbour of *Iate*, an indifferent anchorage in lat. 22° 9′ S., known by some of the remarkable pines on the North side of the entrance. According to Mr. Morgan, of the barque *John Williams*, it is a good place for heaving a vessel down, and has plenty of fresh water. A mission station is established on its northern side, a mile within the entrance.

Kuebuni, 8 miles to the south-eastward, is entered between the islands Nau and Nea, where a channel is kept open by the river water. The anchorage, in 11 fathoms, is only suitable for large vessels as a stopping-place, and care must be exercised in entering to avoid a danger lying in the channel. A dangerous 2¼-fathoms patch lies a mile N.N.E. from Kuebüni entrance.

Southward of *Iate Passage*, in lat. 22° 7½′ S., the reef, with 4¾ fathoms on it, lies at about 3 miles from the shore. On the northern side of Iate Passage the reef is shallower and awash in places for a distance of 2½ miles; northward of this, between lats. 22° 5′ and 22° 1′, the least depth of water is 3¼ fathoms. Thence to lat. 21° 18′ S., the reef continues at a general distance of 7 miles from the shore, with many openings through it.

CAPE CORONATION of Cook is not a well marked promontory, but a compact mass of mountains, at the foot of which is a narrow belt of low land with many cocoa-nut trees on it. There is a narrow cut through the reef, opposite a small valley through which a rivulet runs. It will admit a large boat; but beware of the natives. To the North of the Coronation lands is the broad valley and small river *Unia*. The reef and low lands terminate here, and the land falls back and forms a bay sheltered by coral patches. *Port Uinné*, or *Rencontre Bay*, in lat. 21° 59′ S., may be known by some cocoa-nut trees, and by a large red vertical patch on the flank of the hill to the North. The anchorage here is very good. The land to the northward is exceedingly irregular, and is of a reddish tint. Each ravine carries a small river.

On the northern side of Uinné Bay the land is 1,184 ft. high, and 3 miles northward of it is *Kuakue Bay*, 1 mile wide and 1 mile deep. Two patches, of 2 and 1½ fathoms, lie 1½ mile to the northward of its entrance. There is good anchorage in the head of this bay in 15 fathoms. Abreast Uinné and Kuakue Bays are several entrances through the reef: *Unia Passage*, 1½ mile wide, in lat. 21° 58′ S.; *Little Passage*, half a mile wide, in lat. 21° 56′ S.; *Uinné Passage*, in lat. 21° 54½′ S.; and *Kuakue Passage*, a mile wide, in lat. 21° 53½′ S., the latter opening in a North and South direction. The next opening is the *S.E. Solitary Passage*, 2 miles wide, in lat. 21° 49′ S., separated from the *N.W. Solitary Passage*, a mile wide, by Solitary Reef, which shows. At 1½

mile N.W. from the N.W. Solitary Passage is *Pavée Passage*, in lat. 21° 46′; its entrance runs North and South, and is a mile wide. *East N'Goe Passage* runs in S.W., in lat. 21° 43½′ S.; it is a mile wide, and separated from *North N'Goe Passage*, of the same character, by Buende Reef, 5 miles long.

Kundio River enters the sea in lat. 21° 46½′ S., and has an anchorage off its mouth, sheltered from the eastward by reefs. Between this river and Tupeti Island, 6 miles to the N.W., reefs extend to a distance of 3½ miles from the shore, with a passage on either side of them, best understood from the chart. The channel between their eastern limit and the main reef is 1½ mile wide. There is a detached 2-fathoms spot 2½ miles N.E. from the summit of Tupeti Island, and 1½ mile S.W. ½ W. from the North N'Goe Passage. *Tupeti Island* is of a pyramidal form detached from the coast, and may be known by its dark vegetation.

Port Bouquet extends for 5½ miles to the north-westward from Tupeti Island, to *Nemmeni Peninsula*, 1,184 ft. high. It is sheltered from the eastward by two reefs, and has in its centre *Nénou Island*, which is 1½ mile long, in an E. by N. and W. by S. direction.

Tupeti Pass is 2 miles wide, and has a dangerous sunken rock exactly in its centre. To enter by this pass to the southward of the sunken rock, bring the southern extreme of Nemmeni Peninsula to bear S. by W. ¾ W., or the summit of Tupeti Island S.E. by S. ¾ S.; the northern of these courses will lead to the northern entrance of Port Bouquet, close round Nemmeni Peninsula; and the southern will lead up to the southern entrance of the port, which passes close round the northern side of Tupeti Island; the central passage crosses the line of reefs N.E. of the East end of Nénou Island. Nemmeni Peninsula is of a reddish colour, and covered with pines along its eastern side.

Tchio Pass, 1½ mile wide, in lat. 21° 31¾′ S., is entered by bringing Bouataméré or Nouim'boua Rock, a high black rock covered with pines, to bear S.W. ¼ S. On the S.E. side of the passage is Niléouti Island, low and wooded, situated on the exterior reef. Within the reefs flood tide runs to the N.W., and ebb to the S.E.

Nekete′ Bay, about 17 miles beyond Port Bouquet, has its entrance 2 miles wide between the coast and a small island *Nani* on its northern side. It has good anchorage. *Nékété Pass*, half a mile wide, is entered by keeping Nani Island bearing S.W. by S. ½ S. The reef on the S.E. side of this passage was found to have extended, in 1879. *Constantine Pass*, 3 or 4 miles wide, to the S.E. of Nékété Pass, is separated from Nékété Pass by a reef a mile long, but is useless, as it is nearly blocked up by reefs.

At 3¼ miles E.N.E. from Nani Island is *Ondiao-Oupoura Reef;* and off the North end of this island a reef extends nearly a mile, forming the eastern side of *Lavaissière Bay*, which is 1½ mile in diameter, and has good anchorage in its southern part in 10 to 15 fathoms. Its entrance, between the reef before mentioned and that extending the same distance southward from the extreme of

Meunh Peninsula, is only 2 cables wide, with a depth of 12 to 24 fathoms. From Meunh Peninsula to Cape Dumoulin, a distance of 6½ miles, the shore, which slopes gradually from the ridge to the sea, has a line of reefs, named *Bogota Reefs*, running parallel with it at a distance of a mile. *Laurent Reefs*, three patches extending 1¼ mile in a N.W. and S.E. direction, lie 3 miles E.N.E. from Cape Dumoulin. A 2-fathoms patch lies 1½ mile N. ½ E. from this cape, and *Ana Reef*, awash, 2¼ miles N.W. by N. from it, and East 3½ miles from *Mara Peak*, which is situated on *Cape Begat*.

Meunh Village is situated on the South side of Meunh Peninsula, and just northward of the peninsula is an opening through Bogota Reef, leading to a secure anchorage in *Ouascé Bay*, a mile to the westward, and to several other anchorages in the bays between Meunh and Dumoulin Capes.

PORT KANALA, of which Cape Dumoulin forms the eastern entrance point, is probably the largest port on the East coast. The mountains surrounding it are the highest and most uneven on the coast; and when a double peak in the front range bears S.W. ½ W., it is in one with the entrance point of Kanala, a dark cape with white cliffs. The exterior reef is not more than 4½ miles off shore at Kanala, and there are several entrances through it: one N.E. by N. of the entrance of Kanala; *Kanala Passage*, 6½ miles N. by W. of the entrance; and *Kuaua Passage*, divided by a reef 1½ mile long from the last. Kanala Passage is 2 miles wide. H.M.S. *Havannah* passed through one of these. The harbour is 1¼ mile wide in its entrance, and extends 5 miles to the S.S.E., and has several good harbours at its head, named after the French officers. There is a large settlement here, from which nickel is shipped.

Vessels anchor at the head of the bay at a place called Pic de Mars, but the town of Kanala is several miles up the river, which is only navigable for boats at high water. The natives at Kanala appear industrious and friendly to the few Europeans located here to work the nickel mine, which was first opened in 1875.—*Australian Sketcher*, 1876.

Port Kuaua is 7 miles beyond Kanala, the route between being quite safe. The harbour is good, there is a small river, and but few inhabitants. The harbour is divided into an inner and outer harbour. There is a difficulty in entering with ordinary winds without towing. A detached 9-feet rock lies in the eastern part of the bay, N. by E. ¾ E., distant 6½ cables from the eastern entrance point of the harbour, and three-quarters of a cable N.N.E. of a similar rock. *Waillo* or *Houailou River*, beyond Kuaua, may be recognised by a mountain above it, on which is an oblique mark very much resembling a road, this brought S.S.W., or S.W. by S., leads up to it. There is a large settlement on this river, and much nickel is shipped from the mines in its neighbourhood. Kuaua Passage, through the outer reef, bears N.N.E., 7 miles distant from the entrance to Port Kuaua.

Cape Bocage, in lat. 21° 12½′ S., is composed of high perpendicular hills, visible at a great distance. It is one of the most projecting and distinctly-

marked points on the East coast of New Caledonia. On its western side is *Bâ Bay*, an inlet gradually shoaling from 4 fathoms at its entrance, and at the northern end of the peninsula is a small inlet called *Ugué* or *Forester Bay*; in the neighbourhood of the latter are several mines, principally of nickel, worked by Europeans.

One-tree Island stands on the barrier reef to the S.E. of one of the passes, and abreast of it is One-tree Island on the main. The pass is 3 miles broad, and the single pine noticed by Cook still stood in 1849 on the island, "like the tall chimney of a steam engine." There are several other passes hereabout.

From Ugué Bay to *Cape Bay*, 13 miles to the N.W., the coast recedes considerably so as to leave an interval of 9½ miles between it and the reef, but this space is much blocked up by numerous reefs and shoals, among which are *Bayonnaise Shoals* and *Harcourt Isles*. In lat. 20° 57′ 30″ S., is *East Ti-uaka* or *Cape Bay Passage*, 2 miles wide, with very deep water.

Between Cape Bay and *Cape Tuo* or *Porcupine*, 13 miles N.W. by W., the coast again recedes, and is more free from dangers than the preceding bay. Several rivers fall into this bay, one of which, the Suaka or Tiouaka, has the mission of *Wagap* near its mouth; off it is good anchorage. Cape Tuo has its second name from two clusters of pine-trees at its extremity.

At Cape Tuo the barrier reef approaches within 1½ mile of the coast; it then trends off to the N.N.W., and then to the westward, where it is very irregular and broken as far as Cape Colnett. It reaches to 10½ miles off the land, and within it are several islets and scattered dangers. To the eastward of Cape Tuo is *Tuo Passage*, very deep, and 3½ miles in width. Northward of Cape Tuo is *Tuo Bay*, in which the most dangerous of the reefs are marked by beacons and buoys.

Beyond this, to the N.W., some of the dangers off the coast, and the principal channels through the inner reefs, are marked by beacons as shown on the large scale chart, which will best explain this intricate navigation.

Yengen, or *Ienghène*, was visited by Captain Erskine, in H.M.S. *Havannah*, in September, 1849. "For 3 miles before reaching Yengen (from One-tree Pass, the principal entrance) the coast assumed a very extraordinary appearance, being bordered by a range of perpendicular black rocks, nearly 1,000 feet in height. These rocks were of the most varied shapes, being fluted down the whole of their surfaces, and rising into points apparently as sharp as needles. Toward Yengen this range breaks into several detached rocks, only one of which stands on the northern side of the harbour, of which it is in fact the North head. A very remarkable one on the south-eastern side has a striking resemblance to a ruined castle. The group we called 'The Gates of Yengen.' Having, in company with the bishop, reconnoitred and sounded the entrance, I found that it gradually shoaled from 17 to 4 fathoms. I anchored the ship with the Castle Rock East, and the high rock at the N.W. entrance S.W." This part is sheltered by the outer reefs, through which there

is a wide and deep passage to the bay. The inner anchorage, the French officers say, is not so well sheltered as to be safe. There are two large rivers which enter the harbour, and several native villages. The Gates of Yengen are named by the French the Towers of Notre Dame. The south-eastern one is in lat. 20° 41′ S., long. 164° 58′ 30″ E.

Cape Colnett is not remarkable of itself, but is readily known by the waterfalls that are to the North of it, one of which is a double cascade, but the land is the highest in New Caledonia, the loftiest summit, *Mount Douit*, 5,570 feet, being over it. There is a sand islet off the cape with a deep water channel inside it. The outer reef becomes entirely interrupted before Yengen, which renders it a bad anchorage, but at Cape Colnett it again appears near to the land, and gradually increases in distance from it in going to the North. There are several passages, as shown by the chart, and at 12 miles beyond Cape Colnett is that of *Pouébo* or *Puesepo*, which has a southerly direction; between this and *Leleizour Passage*, 8½ miles to the S.E., there is an opening into a lagoon in the reef, about 3 miles E.S.E. of Pouébo Passage, which might be mistaken for a passage through the reef. The valley of *Puepo* is the first well marked point North of Cape Colnett.

At 2¼ miles S.W. from Pouébo Passage, between a small projecting point in lat. 20° 22′ S. and a reef a quarter of a mile southward of it, is an anchorage off the mouth of Pouébo River, up which river is a mission station, with a road extending from the houses to the mouth of the river, a distance of three-quarters of a mile. The anchorage is insecure with fresh N.E. breezes. Off *Ubati*, 4½ miles S.E. of Pouébo, there is good sheltered anchorage in 4 fathoms.

From outside the barrier reefs in the vicinity of Leleizour Passage the cascade of Tao is the most conspicuous mark, and may generally be seen. The clump of pine trees on Madiémate Point and the church of Pouébo also form good marks, and in fine weather the block-house at Balade will be seen. Douit Peak, and the summits of the mountains near this portion of the coast are frequently clouded over for half their elevation.—*Annonce Hydrographique*, 1880.

Balade is 9½ miles beyond Pouébo. It was visited by Cook in 1774, and D'Entrecasteaux's Expedition also came here, and here the commander of the *Recherche*, his consort, Captain Huon, was buried on Observatory Isle, June, 1792. The coast from Cape Colnett to the *River Baiao*, at Balade, is quite uniform. There is a French mission here; above it are two bare hummocks. The mission chapel is conspicuous, and a short distance S.E. of it are the ruins of an unfinished fort, conspicuous from being kept whitewashed. The present blockhouse is 2 miles further to the W.N.W. and near to the anchorage of Balade; it is the best point to distinguish the place. One necessary observation in making out the place is, that from Yengen there is no sandy beach

visible outside the outer reef until you come to Balade, from which they extend to the West. There are some copper mines in the neighbourhood.

Balade Passage is half a mile wide, and when in the middle of it the blockhouse bears S. $\frac{1}{2}$ W., *true*, and the mission church S. $\frac{3}{4}$ W. From Balade Pass to the anchorage the distance is 4 miles, and the best position is with the blockhouse bearing S. by W., and the old fort kept a little to the left of the church. *Freycinet Passage*, to the eastward, is marked by two beacons on the shore reef, and one on Freycinet Flat.

Amoss Pass, 3 miles to the westward of Balade Pass, is about three-quarters of a mile wide, and its entrance found by bringing the summit of Paon Island to bear S. 79° W., *true*, and when up with the entrance, rounding the reef at a cable distance until the Blockhouse bears S. 29° E. Both passes require great caution in navigating, on account of the currents. The flood tide running into these passages divides into two streams when within the entrances.

Water is easily procured at the mission, and is good; the River Baiao is difficult of access. There are two species of fish, the one red, the other like a sardine, which are very poisonous. It is best to consult the natives before using any caught here.

It is high water, on full and change, at $6^h\ 15^m$. The range at springs is from 3 ft. 6 in. to 4 ft. 3 in.

Diahot River, 80 miles long, enters the sea at Harcourt Bay, 10 miles westward of Balade, from which it is reached by a good channel, and is of increasing interest on account of the recent discoveries of gold on its banks; copper ore is also shipped from here. In its course it passes the villages of Bondé, Manghine, and Diahot. The navigable portion extends from Pam Isle, which stands at the entrance of the river, to Bondé, a distance of 25 miles. At its mouth the river is three-quarters of a mile wide, gradually decreasing till at Bondé it is about 125 yards wide. At 13 miles up are the gold mines of Mouendine or Manghine. The navigable portion of the river consists of deep channels, separated by moving sandbanks.

In the eastern part of Harcourt Bay excellent anchorage will be found near Pam Isle on its eastern or western sides. The bottom is of white sand and good holding ground. An appearance like shoal patches has been observed hereabouts at times after stormy breezes, which cause the sand to rise from the bottom, producing this effect. A *black* buoy is moored in $3\frac{3}{4}$ fathoms, on the West extreme of a sandbank extending from the point eastward of Pam Island, and *Alcméne Channel* to the northward is marked by beacons.

Balabio Island, off the N.E. point of New Caledonia, is not very well known; the barrier reef is 8 miles distant from it. There are some channels within the reefs leading to the N.W., through *De Varenne Strait*, and round the North end of the island to the openings through the reef on its eastern side, before described. De Varenne Strait is marked by beacons.

LOYALTY ISLANDS.

This group, it is said, was discovered by Capt. Butler, in the *Walpole*, in 1800; or, according to others, in the *Britannia*, in 1803. Since 1827, however, they have been frequented by trading vessels, and also have had both Roman Catholic and Protestant Missionaries established on them, It is not until a very recent period that we have had a correct knowledge of either their number or character, and much confusion arose from the erroneous reckonings of some sandal-wood vessels in 1841-2, who, trusting to their defective longitudes, announced some of them, before known, as new discoveries. The Bishop of New Zealand and the French missionaries have now given us more full particulars; but there is still some doubt as to their exact position, as they are reported to lie 4½ to 10 miles East of their present position on the chart. They may be considered as part of the New Caledonia Group, running parallel with the trend of that island, at a distance of 50 to 60 miles, with only one danger announced between them, the *Simpson Reef*, in lat. 21° 30′ S., long. 166° 50′ E. Captain T. B. Simpson says it is of large extent, but it has been sought for without success since.

The group consists of three principal islands, Maré, Lifu, and Uea; between the former two are five smaller islets; the last only having good shelter.

MARE′, or Britannia Island, is the first point made by D'Urville, June 15th, 1827. *Cape Coster*, the N.E. point, is in lat. 21° 29′ 30″ S., long. 168° 6′ E. It is the Burrows Island of 1842. The eastern side of the island lies nearly North and South for the space of 12 miles, a steep cliff, with a narrow beach, or frequently without this. In the southern part cocoa-nut trees and pines were seen. There were no surrounding reefs, except that the North coast is fringed with a coral reef to the distance of about 2 cables. The island rises to an estimated height of 450 to 500 ft.; its aspect is sombre, but large plantations of cocoa-nut trees line the low shores and beaches. The land is throughout of the same character; the whitish cliffs inland, which characterize the hills, giving them the appearance of castles or high walls, indicating a calcareous or madreporic origin. The northern side of the island is a deep bay, having *Cape Mackau* at its West extremity. Cape Coster is a peninsula, surrounded by breakers at a short distance, and *Cape Roussin*, on the North coast, is separated from Cape Coster by an extensive bay. Off Cape Mackau is a small inhabited island, called by D'Urville *Molard Island*; it is only about 3 miles in circuit. On one of its points were some curious pines in the form of columns.

The anchorage is on the North side, between Capes Roussin and Mackau, the N.W. point, to the westward of some perpendicular white cliffs, and with the head to a white patch to the West of these cliffs. Near this is the residence of the English missionary. Off the North shore of Maré Island there

are several coral patches and knolls, with apparently 2 to 5 fathoms water over them, lying about three-quarters of a mile from the beach, and off Cape Roussin, a reef was seen to break for half a mile to seaward.

Tandine or *Undine Bay* appears to afford the only anchorage on the West side of Maré Island; the bay, which is from 5 to 6 miles across, recedes to the north-eastward from Castle Point, and when well open, a large white house will be seen North of a grove of cocoa-nut trees. Here is the mission station, the tower of the church forming a conspicuous mark, visible 12 miles. The population of the island is about 2,000.

A few coral patches were scattered over Tandine Bay, upon one of which the sea was seen to break. Anchorage may be found in 15 fathoms, sandy bottom, with the white house bearing S. 69° E., Cape Castle S. 15° W., and the North extremity of the bay, N. 47° W.—H.M.S. *Pearl*, 1876.

To the northward of Maré, besides Molard Island, previously alluded to, are three other small islands, named by the French *Hamelin*, *Laine*, and *Vauvilliers*. To the East of these is a fourth, *Boucher Isle*, or *Tiga*, 8 or 10 miles in circumference, of coral formation, and from 150 to 180 ft. in height. It has a few small trees and bushes growing upon it, and its shores consist principally of cliffs. No dangers were seen extending from or off it, from H.M.S. *Pearl*.

The eastern point of Tiga Island was found by Lieutenant G. E. Richards, H.M. Schooner *Renard*, 1878, to be in long. 168° 17′ E., or 15 miles eastward of the position shown upon the chart. Ndundine or Molard Island and Mackau Point (the N.W. point of Maré Island) are also a corresponding distance too far to the westward, and probably the whole of Maré Island is equally out of position.

LIFU, or Chabrol, is the island next in order to the N.W. It is a raised coral island, 100 to 250 ft. high, level at the top, with perpendicular cliffs, and quite steep-to, except at some of the points, off which ledges extend into the sea. Its S.E. point, *Cape Pines*, is in lat. 21° 9′ 30″ S., long. 167° 21′ 0″ E. The cape is a projecting promontory, in the form of a peninsula, crowned with a mass of pine trees; hence its name. At 5 or 6 miles N.E. of it, and beyond *Point Daussy*, is a large and deep bay, *Chateaubriand Bay*, which without doubt would offer good shelter against S.W. winds, but must be completely exposed to those from the East, or the prevalent ones. At *Cape Bernardin*, the N.E. point, the coast assumes a new direction, to the westward, and is altogether perpendicular and wild looking.

Cape Escarpé, the North point, is in lat. 20° 44′ 40″, long. 167° 1′ 4″ E. At 7 miles to the West of it there is a dangerous reef, a mile in length and half a mile broad.

The West coast of Lifu is nearly perpendicular in most parts. Its South point, *Cape Deflotte*, is a low point projecting from a steep cliff. At about 6 miles N.W. of it there is a semicircular bay of 2 or 3 miles in diameter, the

South cape of which is covered with pine trees, and which, with the North point, are conspicuous from the offing. It sometimes occurs that this bay is thus mistaken for Sandal Bay to the northward.

Wide or *Sandal Bay* is a considerable inlet on the N.W. coast. It lies between *Lefebvre* and *Aimé-Martin Points*, 10 miles apart; these two points with a third, *Cape Lafond*, to the South, lie nearly in the same line North and South. At 1½ or 2 miles to the eastward of the South point is a high, rocky, perpendicular reddish cliff, covered with pine trees, and off the space between these capes is the dangerous *Selter Bank*, which is about 2 miles off shore, between one of these capes and the high hill on the North side, over Morne Bay. In beating into Sandal Bay do not pass beyond the line of this high hill in one with the white sandy beach near the N.W. part of the bay. In the S.E. part of the bay, near the sandy beach of *Kyjah* or *Caïdja*, there is a small detached islet. Near this there is a bank sufficiently deep whereon to anchor, if necessary, with Cape Lefebvre bearing S. 80° W. *Morne Bay*, or *Uacho*, is a slight indentation in the N.E. part of the bay. Nearly in its centre is a large black rock on the beach, called the *Tower*, from its form. There is anchorage either to the East or West of this rock. The eastern anchorage is abreast of the Protestant church, with the Bluff (Le Morne) bearing S. 84° W., and Tower Rock N. 26° W., by compass. The western anchorage is near the Catholic mission, but is only fit for small vessels.

H.M.S. *Havannah* anchored in the N.E. bay. Captain Cheyney says the best anchorage is at Caïdja. He also says that no part of the bay is safe during the hurricane months, say from December till the latter end of March.

The Island of Lifu, although thickly clothed with timber, will bear no comparison with the Isle of Pines. Fresh water is very scarce.

The natives of Lifu, about 7,000 in number, are about the middle size, and exhibit much variety of figure. Their complexion is between that of the black and copper-coloured races. The males go entirely naked; and the only dress worn by the females is a fringe about three inches wide tied round the body. They were at one time cannibals, and very treacherous, but are now said to be peaceful and industrious.

UEA, Uvea, or Halgan, is separated from Lifu by a channel 20 miles broad. It is a narrow belt of raised coral, extending 23 miles S. by W. and N. by E., with a mean breadth of 1½ mile, except in the North part, where it is 7 or 8 miles broad. Towards the N.W., a chain of islets, the *Pleiades*, extend in a circle from the North to the South end of the island, encircling a lagoon of 12 or 15 miles in diameter, called after the good New Zealand pastor, *Bishop Selwyn Sound*, in which are several anchorages reached by the passages between these coral islets. The village of *Faiaoué* or *Idgawee* and a mission station are situated on the S.E. side of this bay, and the village of *Achir* is on the N.E. side, and here is a conspicuous white church, visible 10 or 12 miles. The island itself is low, with many abrupt rocky eminences, which

at a distance resemble fortifications. It is the only one of the Loyalty Group which affords safe shelter.

A small coral knoll, with 3 fathoms over it, lies with Observation Islet, in the northern part of the sound, bearing N. 85° W., and Cap Hill N. 12° W. Another coral head, over which there is a depth of 2 fathoms, lies with Faiaoué church bearing S. 67½° E., distant 9½ cables.—*Annonces Hydrographiques*, 1882.

Off the S.W. point of Uea is *Moali* or *Badeneu Island*, not more than 5 miles long. Its South coast is foul, the dividing channel is only fit for boats. The South coast to *Point Faïaoue* (*Fizaway*), or *St. Hilaire*, a distance of 10 miles, is a high, flat-topped cliff. Off the latter is a detached columnar rock. All the East part of the coast is covered here and there with trees for 10 miles to *Cape Escarpe* (steep), from whence it turns to *Cape Rossel*, 5 miles to the N.W. At 6 miles W. by S. ½ S. from this is a small opening for boats, and here commences the range called the Pleiades.

The first islet of the Pleiades resembles a ruined tower. There is no passage on either side of this. The next islet is called La Baleine (whale) or Isénay. Between this and the next islet, La Tortue (turtle) is the Whale Pass of M. Grimoult, narrow, but deep, and running to S.S.E. The third (Tortue) islet is a flat rock; but the fourth (*Fatouba*) is also flat, and care should be taken not to attempt the apparent passage between the two last. The pass, as above said, is between the second and third islets. The fifth islet, *Pine Islet* (or Honegueneck), is lower and longer than the others, and has three clumps of columnar pine trees equidistant on its centre.

The *Bull Entrance*, the great *N.W. Pass*, is between the last and the following islet (*Olo*), nearly a mile wide, with 12 fathoms water, in a S.E. by E. direction. The passes to the westward, between Olo and *Deguala Islets*, appeared to Lieutenant Jouan, of the *La Bonite*, in 1860, to be bad. We have derived some of the foregoing particulars from his account. Capt. Sicard, of the *Arche d'Alliance*, has described some other passes to the westward.

The *southern entrances* are in some degree preferable, from the wind being more favourable. The *Styx Passage* of M. Grimoult is taken by approaching (not too near) to the South point of Mouli or Badeneu Island, and then steering, at three-quarters or 1 mile off shore, to W. by N. for 2 miles, when the entrance will be found between the *third and fourth* islet. It is broad, safe, and excellent, running to North and N. by E. The broad pass of Anemata is further to the West.

From this entrance to the Catholic mission there is a clear passage. The mission may be seen from afar by a large church, the mission-house being near it. The best anchorage is near Faïaoue, or *Sandalwood Wells*, in 4½ fathoms, with the chief's house bearing S.S.E. and the Protestant mission-house about 2 miles off.

Uea is the most fertile of the group, and poultry and pigs may be procured, but good water is scarce. The inhabitants of the southern portion are a different and milder race to the northern tribe. It was conquered by a New Caledonian chief, Whiningay, since dead. The northern tribes, it is supposed, came from Uea or Wallis Island, and gave the present name to the island.

Beaupre' Islands were discovered and named by D'Entrecasteaux, after the celebrated hydrographer. D'Urville's position of them is lat. 20° 18′, long. 165° 59′ E. (N.W. point of the reef); the Admiralty chart places it in lat. 20° 13½′ S., long. 166° 10′ E. They consist of three small low islands, covered with cocoa-nut trees, and surrounded by a coral reef, which extends from the islands some distance to the N.W. and North. The largest island is at present inhabited by natives of Uea Island.

ASTROLABE REEFS nearly proved fatal to D'Urville's ship; they are 30 miles from Beaupré Islands, and 45 to 60 miles from the nearest point of New Caledonia. The southernmost of them may be about 4 or 5 miles from North to South. At the North extremity is a sandy islet, nearly level with the water. The northernmost of these reefs is 15 miles distant from the other, and 6 or 7 miles from North to South. The North point is in lat. 19° 40′ 20″, long. 165° 26′ 24″ E.

Petrie Reef was discovered March 16th, 1835, by Lieut. Peter Petrie, R.N., in the barque *Betsey*. No part appeared above water, but it was just awash, extending 8 miles S.E. and N.W. This reef was sighted by Mr. Goodall, in the *May Queen*, in March, 1874, and its position was determined by him. The reef is about 5½ miles long, North and South, and 3 miles broad. On its N.W. side is an opening, about 2 miles wide, leading into a lagoon which apparently has deep water; a detached reef lies just within, on the N.E. side of the entrance. There appeared also to be a small opening at the southern extremity of the main reef. On the western and S.E. sides of Petrie Reef are sand-banks from 20 to 25 ft. high. Off the North extremity a strong tide rip was observed, the stream at the time setting to the N.E.

The North point of Petrie Reef is in lat. 18° 31′ S., long. 164° 26′ E., the South point in lat. 18° 36′ 26″ S., long. 164° 24′ 35″ E.

CHAPTER XI.

THE LOW ARCHIPELAGO, OR PAUMOTU GROUP.

This vast collection of coral islands, one of the wonders of the Pacific, extends over 16 degrees of longitude, without taking into consideration the detached islands to the S.E. of it. They are all of them of similar character, and exhibit very great sameness in their features. When they are seen at a distance, which cannot be great on account of their lowness, the aspect is one of surpassing beauty, if the dry part of the island or belt is sufficiently covered with trees; but much of this beauty is dispelled on a nearer approach, as the vegetation is usually found to be scanty and wiry. Their ordinary and distinctive features will be sufficiently adverted to in the detailed description ensuing.

The names applied to the group are characteristic. It is sometimes called the *Dangerous Archipelago* (first so by Bougainville), a character much more formidable in former years, when knowledge was much more imperfect. The native name, which is variously spelt, *Paamuto* (FizRoy), *Paumotu* (Wilkes), *Pomotou* (Vincendon-Dumoulin), signifies "a cloud of islands,"—an expressive term. It is called *Tuamotu* in the late French reports.

The form and formation of a coral island are among the most interesting phenomena in nature, and of late have received much attention. The remarks that have been made by various observers cannot be here detailed.

From the extent of the Archipelago, and the character of the islands, they have been discovered by various navigators, whose voyages have extended over a very long series of years. The first who gave any notice of their existence was Quiros, who, in 1606, saw several islands on the South and North sides of the group, all of which have not yet been satisfactorily identified. Le Maire and Schouten, in 1616, discovered several islands in the North part; and Roggewein, also in the North, passed here in 1722. Subsequently to this, Byron (1765), Wallis and Carteret (1767), Cook (1769, 1773, 1774), Bougainville (~~1766~~), Boenecheo, captain of the Spanish frigate *Sta. Maria Magdalena* (1772—1774), Edwards (1791), Bligh (1792), Wilson (1797), Turnbull, in the *Margaret* (1803), have all given us some additions to the history of their discovery. More exact observations were then made by Kotzebue (1816),

Bellingshausen (1819), and Duperrey (1823). Beechey (1826), FitzRoy (1835), and Wilkes (1841), have given us more accurate details. All these will be hereafter noticed. Since that period the French have made many observations as to their position and character, and from them we have derived many of the subsequent details.

The natives are not all of the same origin. Some of them resemble the Fijians in the darkness of their skins, their figure, and their ferocity. Others have the more gentle character of the Tahitians; but it is acknowledged that they have a more warlike disposition than the latter, and for this reason Pomare I. kept a body guard of them in preference to his own subjects. They apparently speak a different dialect of the great Polynesian language to that of Tahiti, but it is soon acquired by others. The greater part of the natives are reputed to be an honest and trustworthy race. They are all, or nearly all, in the western part converted to the Protestant religion, which is zealously and conscientiously followed. The French Roman Catholics have an establishment in Anaa, and another at Mangareva.

The islanders navigate among the different groups; but the most venturesome are those on Anaa or Anha, or Chain Island. Their vessels are double canoes, about 35 ft. long, and 4½ ft. wide, connected by a strong framework, on which is placed a deck, and sometimes a temporary hut. They are built of wood sewn together, and hoist two large mat sails on separate masts. They are strong, and have no difficulty in navigating; but sometimes they are blown away in storms, which they say come from the N.W. They are thus frequently obliged to take refuge on strange islands. The trade of the islands is carried on by merchants of Tahiti, who are principally English and American.

The Archipelago, like the adjoining groups of the Marquesas and the Society Islands, are now French possessions, and the officers of this nation have made us more intimate with the details of their geography than could be obtained from the desultory observations of former visitors. The western groups were first minutely examined in 1850, by Capts. Delamarche and Gizoline, who found very considerable errors in the charts. After that period, the daily intercourse between Nukahiva, Anaa, and Tahiti, was carried on by a circuitous and tedious route, first South and then East, to double the Low Archipelago to windward for the Marquesas. Now this is abandoned, and the islands being well known, they beat through the Archipelago in half the former time. The later examination was made by Lieut. Caillet, under the orders of Contre-amiral Page, in 1853.

There are 78 islands, 18 are uninhabited, and 16 are still occupied by savage tribes. These are in the south-eastern parts of the group, farthest removed from the civilizing neighbourhood of Tahiti. The western portion is divided by the French into 4 groups or circles, that to the West with 8 islands, the North with 5, the centre with 14, and the eastern of 17 islands. They are

all coralline, or lagoon-reefs, with three exceptions, and a few have entrances for large vessels.

The native population of the entire Archipelago was estimated by Lieut. Mariot, in 1874, to number 8,000 inhabitants, of whom 1,500 are residents at the little but most important island of Anaa. In 1881 they were estimated to number 7,300. The people are considered much more industrious than their neighbours of Tahiti. They also have the ambition to live in good houses, constructed from the coral, and work to obtain decent clothes and food. Cocoa-nuts, bread-fruit, fish, fowls, and pork, are their food.

The commerce of the islands is much greater than is generally supposed. Owing to the steady cultivation of cocoa-nut trees, a great increase in the value of the products of that tree has taken place in recent years. *Coprath*, or dried cocoa-nut, was exported in 1873 to the amount of 3,000 tons, worth £30,000. Mother-of-pearl shell is the next important item, 400 tons, worth £8,000, having been exported in 1873. This is a great decrease in the value of the latter article over previous years, owing to the oyster beds becoming used up from over fishing. It is probable, however, that this industry will again increase by the adoption of strict preservation laws, and the construction of artificial beds, which seem likely to answer. Pearls are largely exported; and, among other products, a valuable fibre seems to exist in the hanging roots of the *pandanus*, which tree is most plentiful.

The islands would generally be considered to lie within the verge of the regular trade wind, which is observed to blow with considerable regularity throughout the breadth of the Pacific; but from some cause, not satisfactorily accounted for, the land, small in area and unimportant in height, has such an influence, that it interrupts altogether the regularity of its eastern direction. "Not only does the easterly wind often fail among them, but heavy squalls come from the opposite direction, and more frequently by night than by day. This is especially the case from November to March."—(FitzRoy, p. 506.) From this cause it is much better, in the case when their neighbourhood lies in the track of a ship across the ocean, to avoid the Low Archipelago, than to get entangled among its numerous islands and reefs, all requiring the greatest watchfulness, and when the usual facilities for a direct course may fail.

The effect of the prevalent south-westerly gales in the high latitudes, in sending in a heavy sea, which is felt many hundred miles from the place whence it proceeds, occasions a serious obstacle to landing upon the low islands, by rolling in upon the shore in an opposite direction to the trade wind, and thereby making it more dangerous to land upon the lee side of the island than on the other.*

* Beechey, vol. i., p. 145. Captain Sir Edward Belcher points out a possible source of mistake in announcing the existence of a reef or shoal. During the period of the N.W.

In most of the entrances to harbours in the Lagoon Islands there is a strong current of tide, which sets in and out alternately about 6 hours each way. The tide rises nearly 2, or at most 3 ft. It is high water about 1^h, on the days of full and new moon, among the western groups of islands; and from half an hour to an hour later among those which lie towards the S.E. The currents, which do not appear to be caused by tide, are irregular; and as yet too little is known of their usual direction to enable any one to say more than that, during settled weather and a steady trade wind (south-easterly), the surface waters in general move westward, from 5 to 25 miles a day; and that in the rainy season, from October to March, when westerly winds, squalls, and rain are frequent, the currents vary most, and occasionally set eastward, at the rate of from half a mile to 2 miles an hour.

Numerous instances are upon record of canoes being drifted out of their course, even several hundred miles, by currents and westerly winds; few narratives of voyages in the Pacific are without a notice of them; and they materially assist in explaining how remote, and perhaps very small islands, may have been peopled from the West against the direction of the generally prevalent wind.†

Following the usual plan, we commence our descriptions with the south-eastern islands, and proceed onward to the N.W. But in this we include some islands which lie beyond the limits of the Low Archipelago proper, but which belong to no other system.

DUCIE ISLAND was discovered by Capt. Edwards in 1791. It is in lat. 24° 40′ 20″, long. 124° 48′. It is of coral formation, of an oval form, with a lagoon in the interior, partly enclosed by trees, and partly by low coral flats, scarcely above the water's edge. The height of the soil above the island is about 12 ft., and the trees rise 14 ft. more, making its greatest elevation about

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swell, which exceeded anything he had before seen in the Pacific, the wind backed off to W.S.W. in rain squalls. "In one of these I observed the sunbeams on the horizon, through the surrounding rains, shining on the crests of the swell, resembling very heavy rollers; and although I instantly perceived the cause, and named it, yet having rivetted my attention for some time, I could hardly bring myself to believe they were not heavy rollers probably from hearing those around me confident that they were so. Upon similar grounds, doubtless, many of the reefs and islands in these seas have been reported."—*Voyage of the Sulphur*, vol. i., p. 351.

† One singular feature in the islands is the immense quantities of the common house-fly, which are found in all *inhabited* islands; for on Honden Island, which is without inhabitants, there were none. Their numbers are incredible, and extremely annoying. It has been thought that they had been introduced by the visit of ships; but one of the discoveries was Vliegen (or *Fly*) Island, by William Schouten, on April 18th, 1616. His boat's crew, on landing, found themselves attacked by millions of a sort of black fly, in such prodigious swarms, that the men returned covered with them from head to foot; their very boat and oars were also covered. This dreadful plague of flies lasted three or four days on board the ship after they quitted the island.

26 ft. above the level of the sea. The lagoon appears to be deep, and has an entrance into it for a boat, when the water is sufficiently smooth to admit of passing over the bar. It is situated at the S.E. extremity, to the right of two eminences that have the appearance of sand-hills. The island lies in a N.E. and S.W. direction; it is $1\frac{3}{4}$ mile long and 1 mile wide. No living things, birds excepted, were seen upon the island; but its environs appeared to abound in fish, and sharks were very numerous.

By the soundings round this little island it appeared for a certain distance to take the shape of a truncated cone, having its base downwards. The sand mounds raised upon the barrier are confined to the eastern and north-western sides of the lagoon, the south-western part being left low, and broken by a channel of water. On the rocky surface of the causeway, between the lake and the sea, lies a stratum of dark, rounded particles, probably coral, and above it another, apparently composed of decayed vegetable substances. A variety of evergreen trees take root in this bank, and form a canopy almost impenetrable to the sun's rays, presenting to the eye a grove of the liveliest green. The island was lost sight of at the distance of 7 miles.

ELIZABETH ISLAND, or Henderson Island.—This island was discovered by the crew of the *Essex* whaler, whose singular history is briefly related by Admiral Beechey.* It was afterwards seen by Capt. Henderson.

Admiral Beechey's description is the most ample:—"We found that the island differed essentially from all others in the vicinity, and belonged to a peculiar formation, very few instances of which are in existence. Wateo and Savage Islands, discovered by Capt. Cook, are of this number, and perhaps also Malden Island. The island is 5 miles in length and 1 mile in breadth, and has a flat surface, nearly 80 ft. above the sea. On all sides, except the North, it is bounded by perpendicular cliffs, about 50 ft. high, composed entirely of *dead* coral, more or less porous, honeycombed at the surface, and hardening into a compact, calcareous substance within, possessing the fracture of secondary limestone, and has a species of millepore interspersed through it. These cliffs are considerably undermined by the action of the waves, and some of them appear on the eve of precipitating their superincumbent weight into the sea. Those which are less injured in this way present no alternate ridges or indication of the different levels which the sea might have occupied at different periods; but a smooth surface, as if the island, which there is every

* The fate of the *Essex* was related in a pamphlet by the mate, published at New York. She was struck by an infuriated whale, which, at the third blow, stove in her bows, and she sank. The crew took to the boats, and, first steering southwards, found this island, where they left two by their own request. Two out of the three boats arrived at the coast of Chile, the third was never heard of; but the wreck of a boat and four skeletons were seen by another ship on Ducie Island, which was probably the boat in question. The two men were subsequently taken off by a ship which had heard of their situation; had they known of Pitcairn Island the whole might have been saved. Its N.E. point is in lat. 24° 21′ 20″, long. 128° 19′.

probability has been raised by volcanic agency, had been forced up by one great subterraneous convulsion. The dead coral, of which the higher part of the island consists, is nearly circumscribed by ledges of living coral, which project beyond each other at different depths; on the northern side of the island the first of these had an easy slope from the beach to a distance of about 50 yards, where it terminated abruptly about 3 fathoms under water. The next ledge had a greater descent, and extended to 200 yards from the beach, with 25 fathoms water over it, and then ended as abruptly as the former, a short distance beyond which no bottom could be found with 200 fathoms of line. The sea rolls in successive breakers over these ledges of coral, and renders landing upon them extremely difficult.

"Insignificant as this island is in height compared with others, it is extremely difficult to gain the summit, in consequence of the thickly interlacing shrubs which grow on it, and form so dense a covering that it is impossible to see the cavities beneath. There is no plant producing fruit on it but the pandanus, which is the largest tree. And from the narrative of the wreck of the *Essex* whaler, it possesses no spring; the two men left on it finding sufficient for their daily consumption in a small pool, which collected the drainings from the upper part of the island."—*Beechey.*

PITCAIRN ISLAND.—We have included this well-known island in the present chapter, though its character is essentially different from that of the rest which we have to describe, but its situation places it among the list of Low Islands.

It was discovered and named by Carteret in 1767, but he gives an erroneous idea of its dimensions. It has been by many supposed to be identical with the *Encarnacion** of Quiros, 1606.

Pitcairn Island derived its interest, and that in no ordinary degree, from the mutiny of the *Bounty*. After the mutineers had set Capt. Bligh and the rest of the crew adrift, April 26, 1789, they bore away in the *Bounty* for Otaheite, but they reached Tubuai, and this was the only intelligence gained of them, for they were obliged to leave on account of warfare with the natives; they then went to Otaheite, where Christian, after some had landed, cut the cable and put to sea, and was not heard of for many years.

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* Encarnacion and San Juan Bautista are two islands placed in these parallels by Quiros in 1606; but they have never been seen in the positions he assigned them.

Encarnacion was described as nearly level with the water, 36 miles in circumference, and about 1,000 *leagues* from the coast of New Spain (South America), hence in about lat. 24° 45′ S., long. 136° 40′ W. San Juan Bautista was also described as low, 30 to 36 miles in circumference, in lat. 24° S., long. 139° 10′ W.—W. by N. from Encarnacion.

If we disregard the fact of their having been described as nearly level with the water, they might be Ducie and Henderson Islands, or Henderson and Oeno Islands; regarding them as described, low, they could be, from their lay, Morane and Ahunui, or Tematangi and Nukutipipi, greatly misplaced, as might well be the case when stated to be a given number of leagues from the American coast.

Capt. Mayhew Folger touched at Pitcairn Island, February, 1808, to procure seals, from the account given of it in Carteret's voyage, supposing it to be uninhabited, and for the first time discovered the crew of the *Bounty;* as a test of this, he procured a timepiece and an azimuth compass which had belonged to the *Bounty*. The latter was sent to the Admiralty from Nantucket, March 1, 1813. And nearly about the same time Vice-Admiral Dixon sent intelligence of their existence to Europe, H.M.S. *Briton* having touched there September 17, 1814.

An interesting account of this first visit of Capt. Sir Thomas Staines, in the *Briton*, is given by Lieut. Shillibeer, and naturally attracted a very great deal of interest in Europe. The happiness, simplicity, and excellence of this little isolated community was almost unequalled. It has since been frequently visited and described, and these notices will be found scattered through almost every work on the Pacific. It has been found that the *Bounty's* crew were not the first inhabitants, either permanent or incidental, for several morais, or burial places, have been discovered, the skeletons having a pearl shell (not found here) under the head. Stone hatchets, and other warlike implements, are also among the remnants. Lady Belcher has given the latest account of the *Bounty's* crew, supplying in her book many particulars not previously known. Capt. Bligh is buried in the churchyard of Lambeth, opposite the Houses of Parliament, in London.

The following information is chiefly by Lieut. J. Wood, of H.M.S. *Pandora*, who was here in 1849 :—

The soil is very rich but porous, a great proportion decomposed lava, the other a rich black earth with clayey ground; climate temperate, thermometer 59° to 89° in the shade. Spring commences in August, which is the harvest, when they dig their yams and potatoes, which are their principal food. They have two crops of potatoes annually, which are planted in February and July, and dug in June and November.

Winds.—No regular trade winds. In the summer months the wind prevails mostly from E.S.E. to North. Northerly winds are generally light, often accompanied with rain or fog. When the wind is North it invariably goes round to the westward, from which quarter and S.E. are the strongest gales; when it is S.W. it is generally clear weather with moderate breezes. During the winter season the prevailing winds are from S.W. to E.S.E.

The animals are sheep, hogs, goats, and poultry. Vegetables: yams, sweet and Irish potatoes, the api root and taro in small quantities. Fruits: plantains, pines, melons, oranges, bread-fruit, sugar-cane, limes, and the vi or Brasilian plum. Grain: maize. There are no springs on the island, the inhabitants being dependent on rain for fresh water.

Food: chiefly yams and potatoes. Animal food two or three times a week. Fish is getting scarce. Bedclothes are generally manufactured by the females from the ante or paper mulberry. Wearing apparel obtained from whale-ships

in exchange for vegetables, &c. Often in want of cotton cloth, blankets, and woollen articles; soap scarce. About 8 ships call annually on their way from San Francisco to Newcastle, New South Wales, or England.

The community had been gradually getting too numerous for the capabilities of the island to support them, and therefore it became manifest to those who were interested in them that some important measure should be adopted for their relief. This came in the offer of Norfolk Island as a gift, which, after much deliberation, was accepted, and here they could maintain their isolation and simplicity, with abundance of means for support and luxury. They were therefore entirely removed with all the relics of the *Bounty* by the *Morayshire*, on May 3rd, 1856, consisting of 90 males and 102 females. Of this number, however, 40 soon returned to their old quarters on Pitcairn Island. In 1873, at the time of the visit of H.M.S. *Cameleon*, there were 76 inhabitants living in a simple and primitive way, and dependent on the resources of the island for their support. Epidemic or endemic diseases were unknown. It was also visited by H.M.S. *Shah*, in 1878, when the inhabitants numbered 90.

After the visit of the latter ship a fund was raised in England to supply them with two whale boats, and other necessaries, and they have also received a set of flags and the Commercial Code of Signals, so that passing vessels can now easily communicate with the island.

The island is about 2¼ miles long, in an E. by S. and W. by N. direction, and about 1 mile broad. The entire circuit of the island, with one or two exceptions, is perpendicular, and will not allow of any landing. Its appearance is very pleasant, and its height, about 1,000 ft., will allow it to be seen 50 miles off.

There is nothing particular in its appearance on making it; and lying in the midst of the Pacific, it may be almost said to lie in the variables, as the true trade wind does not blow home.

It is thickly clothed to its summits with the most luxuriant verdure, terminating in lofty cliffs, skirted at their bases with thickly branching evergreens which affords a welcome retreat from the burning rays of an almost vertical sun. The coast is fringed with formidable barriers, which seem to present insurmountable obstacles to landing, except in Bounty Bay, situated on the N.E. side, and even here it is impracticable when it blows strong. On passing round the East end from the southward, *St. Paul Point* is shaped by the most grotesquely formed, tall spiral rocks, and the island called *Adam Rock* becomes visible. Having passed this rock a cable's length to the N.W. you are abreast of Bounty Bay, when you must stand off and on, as there is no safe anchorage.*

* Anchorage off some parts may be had in 30 to 35 fathoms at a quarter of a mile distant, or even more; but the ground being foul, it would be injudicious to anchor, unless to avoid being drifted on shore in calms, &c.—*Capt. Worth, R.N.*

Bounty Bay is the only place where ships communicated with the shore, and this not by means of their boats, but by the island canoes, which are very light, and carried up to the top of the cliffs. *Adamstown*, which is a short distance to the West of Bounty Bay, is the only point where the people used to be congregated. There is another *landing place* at the West end of the island. It is a very good one, with East, N.E., or S.E. winds.

There is very generally a westerly current running past the island, and frequently a strong one; this must be taken into consideration in making the island.

The position of Adamstown, according to the observations of Capt. Beechey, is lat. 25° 3′ 37″, long. 130° 8′ 23″.

OENO ISLAND was discovered by Capt. Henderson, in the *Hercules*, but its name is derived from a whale ship, whose commander thought it a new discovery. It is so low, that it can only be seen at a short distance, and therefore is highly dangerous. The reef completely surrounds the lagoon; near the centre of it is a small island, covered with shrubs; and towards the northern extremity are two sandy islets a few feet above water. The lagoon was in places fordable as far as the wooded island, but in other parts it appeared to be 3 or 4 fathoms deep. The reef is entirely of coral formation, and has deep water all round it. The S.W. part of the reef is the highest, and the lagoon in that part nearly filled up. There are of course no inhabitants. Its North point is in lat. 24° 1′ 20″, long. 130° 41′ W. The American clipper *Wildwave*, Capt. Knowles, was totally wrecked on it in April, 1858. The captain placed it in long. 130° 56′, but Capt. Beechey's position is deserving of all consideration.

Timoe, or *Crescent Island*, was discovered by Capt. Wilson, in the missionary voyage of the *Duff*. It is exactly 3½ miles in length and 1½ mile in width, and of similar formation to Oeno and Ducie Islands. It consists of a strip of coral 100 yards in width, enclosing a lagoon, and generally about 2 ft. above the water. Upon the strip are several small islands, the highest, 6 ft. above the sea, covered with trees nearly 20 ft. high. No entrance; no inhabitants (1861). The South extreme is in lat. 23° 20′ 29″ S., and long. 134° 35′ 8″ W.

Portland Reef, discovered by H.M.S. *Portland*, is said to be 3 miles in diameter, of coral rocks, with 5 fathoms water over them, lying S. 54° E., 45 miles from Mount Duff of the Manga Reva Islands. It is said to be in lat. 23° 39′ S., long. 134° 21′ W., but was searched for unsuccessfully by the *Lamothe Piquet*, in 1868, and the people at Mangareva know nothing of it; nevertheless it may exist.

Minerva Reef, or *Ebrill Island*, placed on the charts in lat. 22° 45′ S., long. 133° 35′ W., is said by Captain Marcq Saint Hilaire to lie a few miles North of that position, and to consist of a great bank on which are some very low islets that have at times been inhabited by persons fishing for nacre. It is

doubtless the same as *Bertero Island*, reported as lying 35 miles to the northward. A bank has been reported, with 9 or 10 ft. water over it, lying 45 miles East of Manga Reva. Its existence is very doubtful.

In 1880, H.M.S. *Alert* made an unsuccessful search for Minerva Reef, with clear weather and a heavy swell running, and as no breakers were observed, or shoal ground found, this reported danger has been expunged from the Admiralty charts.

MANGA REVA, or Gambier Islands, were discovered by Captain Wilson, in the ship *Duff*, May 25th, 1797, and named by him after Admiral Lord Gambier. The group consists of an encircling coral reef of an irregular triangular figure, enclosing five large and several smaller islands. They are of some importance to the navigator, inasmuch as they afford a supply of water (but water only); the only source, except Pitcairn Island, between Tahiti and Peru or Chile. They are now a French possession. In 1878 the missionaries from Easter Island came here, accompanied by about 300 of the natives.

The highest point is *Mount Duff*, nearly in the centre of the group, and 1,248 ft. high. It is at the southern end of the principal island, named *Peard Island* by Captain Beechey, after his first lieutenant. The other islands were named in succession, Belcher, Wainwright, Elson, Collie, and Marsh, after the other officers.

Peard Island is about 4 miles in length, and Mount Duff, at its southern end, rises into two peaks in the form of wedges, very conspicuous at a distance, and may be seen 40 or 45 miles. All the islands are steep and rugged, particularly Marsh Island, which, at a distance, resembles a ship. The external form of these islands conveys at once an impression of their volcanic origin; and, on examination, they all appear to have been subjected to the action of great heat. There are no appearances of pseudo-craters on any of the islands; but they are clothed for the most part with trees. The surrounding reef is conspicuously contrasted to the islands. It is fast growing up in the lagoon, and on the N.E. side already bears a fertile soil, with trees and habitations. In the opposite direction it dips 30 or 40 ft. beneath the surface, affording an entrance to the lagoon within. The outer side of the wall springs from an unfathomable depth; the inner descends with a slope to 120 or 150 ft. The inhabitants, estimated by Beechey, in 1826, at 1,250 or 1,500 in number, have a fine Asiatic countenance, and are fairer and handsomer than the Sandwich Islanders, but less effeminate than those of Otaheite. In 1881 the population numbered about 1,000. The island is one of the chief Roman Catholic missionary stations in the South Pacific. Port Rikitea is open to foreign shipping.

As these islands may be visited for watering, we give Captain Beechey's directions for entering the group:—

This group consists of eight high islands, surrounded by coral islands and reefs, enclosing a lagoon, in which there are several secure anchoring places; but the lagoon has many knolls, which render necessary a good look-out from

aloft, and even the precaution of keeping a boat ahead. As the islands only afford a supply of water, the anchorage under Mount Duff is the most desirable.

The best channel to enter by lies on the S.E. side of the group, to the southward of all the coral islands; and with Mount Duff bearing N. 39° W., *true*, *in one with the South tangent* of the *easternmost* high island (Wainwright). With these marks steer boldy over the reef, upon which there is, in this part, 6 fathoms water, and pass close to the southern extreme of Wainwright Island. Then, keeping a boat ahead, proceed under easy sail for the anchorage in 15 fathoms S.W. of Mount Duff; but do not attempt to go too far to the northward, as all that part of the lagoon is full of reefs and knolls. In this situation a ship will be abreast of two streams of good water; but there will be some difficulty in procuring it, on account of the ledges of coral which surround this and all the other islands. As the ground is rocky it is advisable to use a chain cable.

There are several other anchorages, and water may also be had at the north-eastern island; but this appears to me to be, on the whole, the most convenient. There are also other passages over the reef; and the islands lying to the S.E. may be passed on either side; but those which I have recommended are the best, and most convenient for navigating with the trade wind. The western channel must not be attempted, and all the south-western part of the group should be avoided as dangerous. The best passage to sail out at bears S.W. by S., *true*, from Mount Duff, with the eastern bluffs of Peard Island, upon which Mount Duff is situated, in one, N.E. by N. $\frac{1}{4}$ N. This mark will lead over the bar in $6\frac{1}{4}$ fathoms. Though this channel lies to the leeward of the group, there is generally a very heavy swell upon the reef; and it would not be advisable to attempt it in light winds, as there is no anchoring ground outside; and the swell and the currents, which sometimes run strong, might drift a vessel upon a shallow part of the bar, either to the eastward or westward of the channel, upon which the sea breaks heavily in 4 fathoms, and outside which there is no bottom at 80 fathoms, within 40 yards of the breakers.

The plan which I have given of these islands must not be considered complete, as such a survey required more examination than I could bestow; and there are, no doubt, many knolls of coral in the lagoon which we did not discover. A careful look-out from aloft is therefore absolutely necessary.

The channel eastward of Mount Duff leads into a fine roadstead, large enough for a vast number of vessels; unfortunately there are in it three small obtruding coral heads which are not in all weathers readily perceptible, and are certainly in the way of vessels beating out with the wind from S.E. The bottom is of mud mixed with coral, and the water is generally deeper than ordinary anchorage; the holding is not always good, but that depends upon the slope of the bottom, thus 22 fathoms may succeed 6 fathoms; it is necessary therefore to be cautious. From the reef which forms the port of Rikitea, the depth increases to 25 fathoms, the bottom then rises towards the coral

heads; the eastern side of the roadstead is full of small heads connected with banks. Anchorage during easterly winds is good, but only moderate during westerly winds.

The Port of Rikitea is formed by the spaces between the coral banks which extend along the East side of the Island of Manga-reva, or Peard Island; it affords good shelter for ships, but the depths are very irregular, as close to 11 fathoms there may be only 1, 1½, or 2 fathoms, so that on the whole, it is not safe for vessels drawing over 13 ft.; still, in a calm, and in a case of necessity, a larger ship might, at slack tide, be hauled in: it must be slack, for at certain times of tide the current is strong and variable, and the width, in places, not over 160 ft., so there is no turning. The village with the flagstaff is on the East side of Manga-reva, and north-eastward of Mount Duff.

During a fortnight's stay of the French ship *Le Somme*, in 1871, it was found to be high water at new moon between one and two hours after noon; greatest rise 3 ft. When the tide ebbs a strong current enters at the N.W. channel and runs thence through the S.W. and S.E. channels. A current generally sets to the westward in the daytime, and runs strong in the western channel.

The eastern peak of Mount Duff is in latitude 23° 7′ 58″ S., longitude 134° 55′ 21″ W.

Morane, or *Cadmus Island* is a low coral reef, 5 miles long by 2½ miles broad, without an entrance to the lagoon, in which are situated three low islands, inhabited by a few hostile natives. Position of centre, according to the French despatch boat, *Mégère*, lat. 23° 8′, long. 137° 8½′ W.

Maria, or *Moerenhout Island*, discovered by Mr. Thomas Ebrill, of the *Amphitrite*, in 1832, was also seen in December, 1835, by M. Denis; lat. 21° 59′ S., long. 136° 12′ W. It is long, low, wooded in the centre; the northern and southern extremes planted with cocoa-nut trees; no traces of inhabitants to be seen.

We have also an account of the supposed discovery of a low coral island, on March, 27th, 1837, by Capt. Wright, of the *Medway*:—"At 2^{h} 30^{m} the middle of the island bore due South, distant 4 miles. The whole island might be about 7 miles in circumference, and containing a large lagoon. At the East end there is a reef, about a mile long, on which the sea broke very high. The western extremity is woody, but without any cocoa-nut trees, as is frequently the case; it is apparently uninhabited. The middle of it is in lat. 22° 4′ S., long. (by a good chronometer) 136° 20′ W. This being a new discovery, I have named it Wright's Lagoon Island." This is probably the same as Maria Island.

Marutea, or *Lord Hood Island*, was discovered in 1791, by Captain Edwards, in the *Pandora*. It consists of an assemblage of small islets, rising from a chain of coral, even with, or a little above, the water's edge. "Upon these grew a variety of evergreen trees thickly intertwined, among which the broad leaves and clusters of fruit of the pandanus were conspicuous, and be-

neath them a matted surface of moss and grass, so luxuriantly and invitingly cool, that we were almost tempted to land at any risk." It is $11\frac{1}{4}$ miles in length and $4\frac{3}{4}$ miles wide, in a North and South direction; it is uninhabited, and, like almost all the coral islands, it contains a lagoon (no entrance), and is steep on all its sides. Lat. of the West point, 21° 30′ 50″, long. 135° 33′ 19″ W.

AMPHITRITE, or ACTÆON ISLANDS (*Mature-vavao*), were first discovered by Mr. Thomas Ebrill, in the Tahitian merchant vessel, the *Amphitrite*, in 1833, but were first made known to geographers by Captain Lord Edward Russel, in the ship whose name they bear, January 3rd, 1837. The following is the *Actæon's* account of them:—"While standing to the N.E. we discovered land, and, at three P.M., being within 3 miles of the western island, bearing N.N.W., we made out three very low wooded islands, with a heavy surf on the beach, and no appearance of any anchorage; the north-westernmost island appeared to be a lagoon island, with a reef extending about three-quarters of a mile from its N.W. and N.E. extremes."

More recent investigations prove that, instead of three, there are four islands belonging to the group, and hence some confusion has arisen respecting the names of each island. The probability is that Estancélin Island was never seen by H.M.S. *Actæon*, and therefore we name the three north-westernmost as named in the sketch of Mr. Biddlecombe, master of H.M.S. *Actæon*. In this the centre island is shown as the largest, which could not possibly have been so drawn had Matuerei Vavao been seen, which so far exceeds any of the others in size.

From the latest authorities we gather the following particulars of the islands:—*Matuerei Vavao*, the south-easternmost and largest is about 6 miles long in a N.W. and S.E. direction. It is the same island as *Estancélin*, laid down more to the westward on some French charts. It is uninhabited and wooded, except on its West side. There is no entrance into the lagoon. Its N.W. extremity is in lat. 21° 27′ S., 136° 28′ W.; the S.E. extremity in lat. 21° 31′ S., long. 136° 25′ W.

Tenarunga, or *Melbourne Island*, about 7 miles north-westward of Matuerei Vavao, has about 20 inhabitants, and is wooded. It is misnamed Minto in some charts. Position, 21° 22′ S., 136° 34′ W.

Vehanga, or *Minto Island*, 5 miles to the north-westward of Tena-runga, is uninhabited; in 21° 20′ S., 136° 39′ W.

Tena-raro or *Bedford Island* has about 20 inhabitants, and is wooded. It lies 4 or 5 miles north-westward of Vehanga, in 21° 18′ S., 136° 42′ W. The last three islands are stated by Lieut. Parchappe to be each about 2 miles in diameter.

The current of these islands, with a light westerly wind, sets E.N.E. 7 miles in twenty-four hours; but it varied with the wind, and usually set to the westward.

Tureia, *Papakena*, or *Carysfort Island*, was discovered by Capt. Edwards, in the *Pandora*, in 1791. It is of coral, and the strip of land is so low, that the sea in several places washes into the lagoon. The weather side and points of the island, as in others, are most wooded; but the vegetation on the whole is scanty. A few people; no entrance. Lat. of the East extreme 20° 44′ 53″ S., long. 138° 22′ 30″ W.

Fangataufa, or *Cockburn Island*, was discovered by Captain Beechey, Feb. 2nd, 1826, in a search for Osnaburgh Island of Captain Carteret. It is a small coral island, 3¾ miles in length by 3 miles in width. Its form is nearly an oblong, with the southern side much curved. The lagoon in the centre was deep; its boundary very low and narrow, and in places it overflowed. No cocoa-nut trees. It is uninhabited (1861). The hillock at the N.E. end is in lat. 22° 12½′ S., long. 138° 42′ W.

Mururea, *Vairaatea*, or *Osnaburgh Island*, was discovered by Capt. Carteret in 1767, who describes it as being small, flat, and so far awash, as scarcely to merit the name of an island.* The progress of this coralline formation is interesting in the history of these low islands. In 1792, the *Matilda*, a whaler, was wrecked in the night-time on a reef of coral rocks, in lat. 22° S., and long. 138° 34′ W. In February, 1826, Capt. Beechey, exploring the vicinity, determined the identity of these same spots, by finding on the back part of the reef unequivocal signs of a shipwreck; two anchors, a cannon, metal boiler, and a leaden pump, dated 1790. That these were the remains of the unfortunate vessel in question there can be but little doubt, though they now lay beyond the reach of the waves, and the island on which they were found extends 14 miles in length, and has one of its sides covered nearly the whole of the way with high trees, which, from the spot where the vessel was wrecked, are very conspicuous, and could not fail to be seen by persons in the situation of her crew.

This island differs from other coral formations in having a greater disproportion in the growth of its sides. The one to windward is covered with trees, as before mentioned, while that to leeward is nearly all under water. The dry part of the chain enclosing the lagoon is about a sixth of a mile in width, but varies considerably in its dimensions; the broad parts are furnished with low mounds of sand, which have been raised by the action of the waves, but are now out of their reach, and mostly covered with vegetation. The lagoon, which is generally 20 fathoms deep, is dotted with knolls or columns of coral, which rise to all intermediate heights between the bottom

* It is probably the two low islands thought to have been discovered by the brig *Dagget*, as announced in the "San Francisco Herald." Another island, 21° 39′ S., 138° 32′ W., is announced in the "China Mail," and is most probably the same, but as this part of the Low Archipelago has not been thoroughly surveyed, there may be some discrepancies.

and the surface, and are dangerous to boats sailing in the lagoon with a fresh breeze, particularly in cloudy weather, as they are then difficult to distinguish.

The lagoon was entered by an opening to the eastward. The channel was sufficiently wide and deep for a vessel of the class of H.M.S. *Blossom*, but is now closed (1861). It has now about 100 inhabitants who are said to be hostile.

The island, which differs very considerably from the position given by Capt. Carteret, is in lat. 21° 50′ 32″, long. 138° 44′ 28″ W., E. extreme; but the reef was unsuccessfully sought for many miles in the passage in both directions. Matilda Reef and Osnaburgh Island may therefore be considered as identical.

Tematangi, or *Bligh Island*, was discovered by Captain Bligh, in 1792, and named by him *Lagoon Island*. The natives seen by Captain Beechey are darker than the Lagoon Islanders of Cook, and were all provided with stones, clubs, and spears. A portion of these hostile natives were removed to Tahiti in 1858. They were strongly suspected of having eaten the shipwrecked crew of the *Sarah Anne*. It is about 7 miles in diameter, and its North end is in lat. 21° 37′ 45″ S., long. 140° 40′ 15″ W. It was visited by Lieut. Kertanguy, of the French schooner *L'Orohena*, 1880; he found the natives, about 60 in number, very suspicious, and frequently reduced to great straits through hunger, they having only the fruit of the pandanus to live on. An interesting account of the way in which he opened up relations with them will be found in the "Revue Maritime et Coloniale" 1881, p. 138.

DUKE OF GLOUCESTER ISLES are a small group about which there is some confusion of names, especially in the native names, M. Cassini, in 1861, giving a different nomenclature to that previously applied. There are also more islands. The name was given by Carteret in 1767.*

Nukutipipi, or *Margaret Island*, is charted from the observations of the *Margaret*, in 1803. Its true position was also ascertained by the United States' Expedition. M. Mauruc says that there is no entrance to the lagoon, and but little or no mother-of-pearl. There are some cocoa-nut trees, but no people. From the American examination it proved to be a small, round lagoon island, 2 miles in circumference, high, and well wooded on the North side, with a flat, submerged reef on the S.E. and East sides. Its S.W. point is in lat. 20° 42′ 15″ S., long. 143° 6′ W.

Anu-anuaruga, *Coronados*, or *Four Crowns*, was discovered by Quiros in 1606. It has now *five* clumps of trees. It had no opening to its lagoon, nor could a landing be effected. No traces of inhabitants were seen on either side of the last two islands. Lat. 20° 38′, long. 143° 19′.

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* Among the islands, whose existence is now disproved in the positions assigned, is that extensive group called *St. Elmo* by Quiros, in 1606, which, according to Burney's account, is in lat. 21° 20′ S., long. 143° 50′ W.; it is low, surrounded with coral reefs, and having a circumference of 30 Spanish leagues.

Anu-anuraro, or *San Miguel Arcangel Island*, is one of the earliest discoveries in the Pacific, having been named by Quiros in 1606. Its true situation and character were not, however, ascertained until the visit of the United States' Exploring Expedition in 1841.

On the 10th of January, Lieut. Ringgold made what they supposed to be the Island of Arcangel, but very much out of place :—"It is a small lagoon island, of oblong shape, lying N.W. and S.E., wooded on the N.E. and East, with a stunted growth of trees. No cocoa-nut trees were seen, and the eastern portion of the trees appeared as if burnt. A reef extends off the N.W. and S.W. sides, with a heavy surf, and there is a submerged reef on the South and West sides. No opening exists, and a landing cannot be effected without imminent danger to the boats. Its centre is in lat. 20° 25′, and long. 143° 31′. The supposed situation of Arcangel was then searched for, but no signs of land found. *Turnbull Island* was also looked for in vain."

Hereheretue, or *San Pablo*, was also discovered by Quiros, in 1606, and was examined by Lieut. Com. Ringgold, in the American exploring vessel *Porpoise*. M. Maurue says it is very low, but the former that it is higher than those to the S.E. of it. It encloses a lagoon, 3 miles in diameter, but has no pearl-shells. It has several cocoa-nut groves. No opening was seen into its lagoon. The inhabitants were the dark-skinned race who resisted the landing of the Americans; their village is situated on the West point. North end, lat. 19° 52′ S., long. 145° 0′ W.

Vana-Vana, *Kurateke*, or *Barrow Island*, was discovered by Capt. Beechey, on January 31st, 1826.* It is a small coral island, only $1\frac{3}{4}$ mile in length North and South, and 1 3-10th mile in width. It consists of a narrow strip of land, not more than 200 yards wide in any part, with a lagoon in its centre, probably of no great depth, with no entrance to it. Upon the shores of the lagoon the pandanus, cocoa-nut, and evergreens common to these formations constitute a thick wood, affording a cool retreat from the scorching rays of a vertical sun, and the still greater annoyance arising from the reflection of the bright white sand. Under these trees Capt. Beechey found three large pits, containing several tons of fresh water, and not far from them some low huts, apparently long deserted, but containing some evidences of former visitors. These were subsequently found to be a party of natives from Chain Island, who had been drifted here, and were afterwards found by Capt. Beechey at Byam Martin Island. Capt. Beechey's party collected a tolerable supply of hard wood on Barrow Island, very well adapted for fuel. No natives on it, but some of their canoes were found on the lagoon. There were, in 1861, a few hostile people. The North end is in lat. 20° 45′ 7″ S., long. 139° 3′ 9″ W.

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* *Faith Island* is marked by Lieut. Raper as lying between Osnaburgh and Barrow Islands in lat. 21° 10′ S., long. 138° 52′ W.

Pinaki, or Whit-Sunday Island, was discovered by Capt. Wallis in 1767, but is 40′ to the West of his position of it. Capt. Beechey says it is only 1½ mile in length instead of 4 miles, as stated by Capt. Wallis. It is steep all round, of coral formation, and containing a lagoon. The general height of the soil is 6 ft. above the level of the sea, of which 2 ft. are coral rock; from the trees to the surf there is a space of hard rock of nearly 150 yards in length, covered by about a foot of water, beyond which it descends rapidly, and at 500 yards distance no bottom was found with 1,500 ft. of line. On the inner side, from the trees to the lake, is a gentle declivity of muddy sand, filled with shells. The trees, which formed a tolerably thick wood round the lagoon, consist principally of pandanus and cocoa-nut. Capt. Beechey places a large tree near the N.W. extreme, in lat. 19° 23′ 40″ S., long. 138° 40′ W.

Nukutavake, or *Queen Charlotte Island*, was discovered by Wallis in 1767. Capt. Beechey says that it is of coral formation, so grown up that they could not see any lagoon in its centre, as they had done in all the others to the eastward. Several huts and sheds, similar to those on Whit-Sunday Island, occur in a bay on its northern shore, but there were no inhabitants. There were a few friendly natives on it in 1861. Lat. of East extreme, 19° 17′ 40″ S., long. 138° 42′ 28″ W

Reao, or *Clermont-Tonnerre Island*, was first seen by Capt. Duperrey, of the French marine, in *La Coquille*, on April 22nd, 1822. There is every probability, notwithstanding Admiral Krusenstern's opinion otherwise (vol. i. p. 287), that it is the same placed in a different position by the English vessel, the *Minerva*, on June 27th, in the same year, and named after the ship.

Clermont-Tonnerre, named after the French Minister of Marine, bears a very close resemblance to Hood Island, but is inhabited by a few hostile natives, and clothed with cocoa-nut trees. The island is 10 or 11 miles long, W.N.W. and E.S.E., and very narrow, particularly at the extremities, and when seen at a distance does not appear to be half a mile wide. It is of the same formation as Hood Island, but more perfect. With the exception of a few breaks on the southern shore, by which the sea, when high, may at times communicate with the lagoon, it is altogether above water. At the extremities and angles the soil is more elevated than in other parts, as if the influence of the sea had been more felt upon them, and heaped up the coral higher. They are also better provided with shrubs, and particularly cocoa-nut trees, the soil resting upon the debris being probably deeper. The lagoon has several small islets in it, and the shores all round are steep, and abound with fish, but Capt. Beechey did not see any sharks. The East end of the island is in lat. 18° 33′ 42″ S., long. 136° 20′ W.

Pukaruha, or *Serle Island*, was discovered in the missionary voyage of the *Duff*, by Capt. Wilson, 28th May, 1797, who named it after the author of the "Horæ Solitariæ."

The island is 7½ miles in length in a N.W. direction, and 2¼ miles in width in its broadest part. It is of coral formation. Its windward side is the most perfect; the southern side of the chain, however, differs in being wider, and having a barren flat, full an eighth of a mile wide, outside the trees. On this account it is necessary for a ship to be cautious in approaching it during the night, as it is so low that the breakers would be the first warning of their situation. The lagoon is very narrow, and apparently shallow, with several islands in the middle. There is not the smallest opening into it even for a canoe. Besides clumps of trees at the extremities of the island, which at a distance have the appearance of banyan trees, there are several clusters of palms; a distinction recommended by Capt. Beechey to the attention of commanders of vessels, as, besides assisting them in identifying the islands, it will enable them to estimate their distance from them with tolerable precision. There are but few inhabitants on it, and they are hostile. Its S.E. extreme is in lat. 18° 22′ 30″, long. 136° 58′ 30″.—*Beechey.*

Vairaatea, *Pukarunga*, or *Egmont Island*, was discovered by Wallis, 1767. It is of coral, and the reef is so low toward the centre, that in high tides there can be no communication with the extremities. The island is steep, like all the other coral islands, and well wooded with cocoa-nut and pandanus trees, and has one of the large clumps at its N.W. extremity. Capt. Beechey found that no boat could land on the windward island, nor on any other part of the island; to leeward the S.W. swell rolled even more heavily upon the shore than that occasioned by the trade wind on the opposite side. About thirty inhabitants (friendly) in 1861. North extreme, lat. 19° 22′ 59″ S., long. 139° 12′ 3″ W.*

Ahunui, or *Byam Martin Island*, was discovered by Capt. Beechey, February, 1836, and named after the comptroller of the navy. The island is nearly of an oval form, of 3¾ miles diameter. It is of coral formation, and has a lagoon and productions very similar to the other islands recently described. Capt. Beechey procured a large supply of firewood, to which use it is well adapted, as it burns a long time, gives great heat, is as hard as *lignum vitæ*, and is equally good for tools. No entrance; uninhabited. Its North end is in lat. 19° 40′ 22″, long. 140° 24′ 28″ W.

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* *Pukararo, Tres Cocotiers,* or Three Cocoa-nut Trees Island, is first described by M. Armand Mauruc. He saw it from near Egmont Island, and places it in lat. 19° 19′ S., and long. 139° 29′. It is very low and very small, and if not always inhabited, it is so occasionally. In 1869, Capt. Marcq Saint Hilaire, of the French ship *Lamothe-Piquet*, navigating in this vicinity, and having recently left Queen Charlotte Island, came upon *Puka-runga;* he could not find *Puka-raro* in the position assigned it by Capt. Mauruc, and says "the latter is probably on the same reef as the former; Puka is the name of a tree which is abundant on the eastern island, and there are some also on the western island: *runga* signifies windward, and *raro*, leeward; the traders call the reef Vairaatea, the eastern island on it Puka-runga, and the western island Puka-raro."

Manuhangi, or *Cumberland Island*, was discovered by Wallis in 1767, who describes it to be 6 miles long and 1¼ mile broad. Its North end is in lat. 19° 9′, long. 141° 11′ W. No inhabitants; no entrance. Wooded, except to the S.W.

Paraoa, or *Gloucester Island*, was discovered by Capt. Wallis in 1767. "Its appearance has been accurately described by its discoverer, but its present form and extent differ materially. At the S.E. angle of the island we noticed a morai built of stones, but there were no inhabitants upon the shore."—(*Beechey.*) Lat. 19° 8′ S., long. 140° 37′ W.

Akiaki, *Lanciers*, or *Thrum Cap Island*, discovered by Bougainville in 1768, and seen by Cook in 1769, is of coral, three-quarters of a mile in length, well wooded, and steep all round. Some slabs placed erect, and a hut, showed it had once been inhabited. M. Bougainville gave the name Des Lanciers to it prior to Cook's visit in 1769, in consequence of the people on it being armed with long spears. There were a few hostile natives on it in 1861. The captain of the *Lamothe Piquet* reports that the French flag has been hoisted on its North side. The island is well wooded, except on the eastern side. There are no cocoa-nuts. Lat. 18° 30′ 8″, long. 139° 11′ 30″ W.

Vahitahi, *Four Facardins*, or *Lagoon Island*, was discovered by Bougainville in 1768, and Capt. Cook saw it in his first voyage in 1769.

It is 3 miles in length in a W. by S. direction, and 1½ mile in width. Its general figure has been accurately described by Cook; the southern side is still the low reef of breakers which he saw, and the three shallow openings on the North shore have disappeared. Capt. Beechey speaks highly of the natives for integrity and good nature. He purchased a quantity of cocoa-nuts. It is still inhabited. The North extreme is in lat. 18° 42′ 26″ S., the East extreme in long. 138° 50′ W.

Tatakoto, or *Narcissus*, or *Clerke Island*, was discovered by Bonecheo in 1774. It is described to be 4 miles in length and 1 mile broad; it is very low, and encloses a lagoon, with no entrance. The northern part is wooded; cocoa-nut trees are abundant; the southern part is only formed by a reef. M. Mauruc says that the inhabitants endeavoured to cut off (in 1839) the boats of a ship sent to communicate with them. A spot on the North side, about 1 mile westward of the N.E. extremity, is in lat. 17° 22′ 30″ S., long. 138° 17′ 30″ W.*

Amanu, or *Moller Island*, was discovered by Capt. Bellingshausen, in 1829.

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* Tatakotopoto, or *Anonymous Island*, according to M. Mauruc, from native information, lies in about lat. 17° S., long. 138° 15′ W. It is said to be low and inhabited by a hostile race. It is wooded, except in the East. In 1871, Capt. Prouhet, of the *D'Entrecasteaux*, made Tatakoto Island, and on a beautiful clear day steered for the assigned position of Tatakotopoto, and saw no signs of an island; the yacht *Sunbeam* also passed close to its assigned position in 1876, without seeing anything of it. Its existence is therefore disproved.

According to him it trends N.E. by E. and S.W. by W., 17 miles in length, and is 7 miles broad. Inhabitants friendly; pearl oyster abundant. Its N.E. point is in lat. 17° 43′ S., long. 140° 37′ W.

HAO, or HARPE, or *Bow Island* (Heyou, *Beechey*, or Ocheou, *Belcher*, or Eaoo), was discovered by Bougainville in 1768, and was visited in the following year by Capt. Cook, who gave it its second name from the appearance of its shape, although the survey of it gives it a very irregular figure. For several reasons it is an interesting island. It was minutely surveyed and examined by Capt. Beechey, in the *Blossom*, in 1826, and was selected for the experiments on the nature of coral structures by Sir Edward Belcher.

By Capt. Beechey's trigonometrical survey, Bow Island is 30 miles long by an average of 5 miles broad. It is similar to other coral islands, confining within a narrow band of coral a spacious lagoon, and having its windward side higher and more wooded than the other; which, indeed, with the exception of a few clusters of trees and heaps of sand, is little better than a reef. The sea in many places washes into the lagoon, but there is no passage for a boat except that by which the ship entered to the N.W., which is sometimes dangerous to boats in consequence of the overfalls from the lagoon, especially a little after the time of high water. It may be known by two straggling cocoa-nut trees near it on the western side, and a clump of trees on the other.

The strip of low land enclosing the lagoon is nearly 70 miles in extent, and the part that is dry is about a quarter of a mile in extent. The inhabitants are friendly; there was an abundance of pearl oysters. At the time of the visit of the *Mésange* in 1875, there were about 150 inhabitants.

Capt. Sir E. Belcher's later observations subjoined will be useful to the navigator in visiting this island.

"At the period of the *Blossom's* visit the wind and current on his entrance as well as exit favoured him, but no sound conclusion or direction for navigators could be deduced therefrom. A *fair* wind out would be *foul weather* wind inside. In both cases, on reference to the *Blossom* and *Sulphur*, the winds at entrance and exit ranged from East to E.N.E., or leading winds.

"We found the time of exit or entry depended also on the time of high or slack water, and that it was necessary to watch this at the entrance, as the velocity of the ebb, when much water had been forced into the lagoon, prevented the ship from steering. It is at all times a difficult place to enter with a vessel drawing over 15 ft. It cannot be entered against the ebb without a breeze which would command 6 knots at least, as the current, which has 1 foot fall, runs above 4 knots.

"Approaching from seaward the state of the current can generally be pretty fairly estimated by the 'tail race,' which sweeps to sea about three-quarters of a mile. The instant this slackens or ceases the entrance may be approached. The starboard side close to the breaker is the boldest, but a rock near the

inner point, having only 9 ft. on it, must be avoided. The two cocoa-nut trees over the western point, *clear* of the *bushes*, notes it, as well as one on the opposite side. These two rocks form the gateway of the channel, and as all the rocks are *plainly visible*, they are easily avoided."

It has been stated that the tides in the Pacific did not follow the usual laws; but the experiments carried on carefully by Sir E. Belcher, disprove this. The tides on the *outer* reef conform to these laws, and the time of high water on full and change may be assumed at $2^h\ 40^m$; rise 2 ft. 9 inches.

The experiments of Capt. Sir E. Belcher in boring the coral on the inner side of the island were conducted with considerable difficulty, and proved, after 35 days' hard labour, and piercing to the depth of 45 ft., when the auger broke, that nothing but sand is found below 20 ft. The site of his labours is marked by seventeen cocoa-nut trees, 15 ft. apart, planted nearly on the same line; on the nearest of which is a copper plate stating its locality.

The water obtained at Bow Island is not wholesome, unless for immediate consumption, perhaps scarcely for this. It is worthy of special attention to other navigators that the water obtained by digging within 4 ft. of the flow of the sea, and allowed to settle, and then *rebaled*, was preferred by the natives, and approved by Sir E. Belcher.

The position of this island may now be considered as well determined by the observations of Beechey in 1826; of M. Parchappe in 1860; and those more recent ones by the *Lamothe Piquet* in 1871. The position of a spot on the East side of the N.W. entrance of the lagoon is in lat. 18° 4′ 30″ S., long. 140° 59′ 30″ W.

Nengo-Nengo, *Prince William-Henry* or *L'Ostange Island*, was discovered by Wallis in 1765, though there is some discrepancy between his latitude and and that of L'Ostange Island of Duperrey; but there remains little doubt, on an examination of their calculations, but that they are identical. Duperrey says that this island is about 5 miles long in an East and West direction, and its East point is in lat. 18° 46′ S., long. 141° 39′ W.

The southern island is a bare reef on its S.E. and West sides, with a cocoa-nut grove on the South end. No entrance exists to the lagoon, and no natives. The southern portion of the northern isle is a bare reef with some high clumps of trees on the eastern side.

Two Groups (*Marukau* and *Ravahere*, or *Manaka* and *Dawhaida*), were discovered by Cook in 1773. According to M. Mauruc they are very low, and each enclosing a lagoon. Communication can be made to the first in a canoe by a small passage situated in its S.S.E. part. Mother-of-pearl is found in it. They are separated by a channel which narrows very much in its western part, but still room enough for the largest ship to work. The people are very friendly. M. Mauruc says that being embayed under the land one morning, and having doubled several points with great difficulty, they were forced to

take this channel, which they got through without any trouble. The pass is in lat. 18° 10′ S., long. 142° 7′ W.

Capt. Beechey places the North extreme in lat. 17° 58′ 20″ S., long. 142° 8′ W., and the South extreme in lat. 18° 18′ 10″ S., long. 142° 6′ 45″ W.

Reitoru, *Heueru*, or *Bird Island*, was discovered by Cook in 1769. It is small and low, and encloses a lagoon. It is resorted to by birds in large flocks for incubation. It is uninhabited, but has pearl shells. Captain Beechey places it in lat. 17° 48′ S., long. 143° 7′ W.*

Hikuero, or *Melville Island*, was discovered by Capt. Beechey in 1826. According to M. Mauruc it is well wooded, very low, and enclosing a lagoon, with a very small passage by which communication can be made in a small boat; some mother-of-pearl; no fixed inhabitants. The North end is in lat. 17° 35′ 28″ S., long. 142° 37′ W.

Tekotota, or *Doubtful Island*, discovered by Cook in 1770, is a circular reef, 1 mile in diameter, on the West point of which is a conspicuous tuft of trees. Lat. of the West point, 17° 20′ 16″ S., long. 142° 27′ W.

Taueree, or *St. Simon*, or *Resolution Island*, was discovered by Bonecheo in 1772, and named by Cook in 1773, after his ship. It consists of two small isles, together about 4 miles in circumference; it has three clumps of cocoa-nut trees upon it, but of its South and West sides the greater portion is a bare reef.

M. Mauruc says it is small, low, and encloses a lagoon. No mother-of-pearl; but few cocoa-nut trees. There is a passage for a canoe nearly in the W.N.W. part; very few people, but very harmless. Captain Beechey places it in lat. 17° 22′ 20″ S., long. 141° 24′ W.

Rekareka, or *Good Hope Island*, is wooded, and has a few friendly natives. The entrance to its lagoon is in the N.E. and will admit large boats. The island is 5 miles long N.E. and S.W., and 3 or 4 miles broad. Its South extremity is in 16° 51′ S., 141° 40′ W.†

Fakaina, or *Predpriatie Island*, was discovered by Kotzebue in the vessel (the *Enterprise*) whose Russian name he gave it, February 26, 1824. "The dazzling whiteness of the coral shore fringed a bright green ground, upon which rose a forest of palms; and we distinguished canoes moving upon a large lake in the centre of the island. Its greatest extent is only 4 miles from E.N.E. to W.S.W. Its centre is in lat. 15° 58′ 18″ S., and long. 140° 2′ 30″.

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* *Buyers Group*, or Reiotoua, stated to exist in lat. 18° 20′ S., long. 143° 7′, was ineffectually sought for by Lieut. Parchappe, in 1853, and it is therefore expunged.

† Humphrey Island (?) is placed among those of doubtful existence by Admiral Krusenstern. Its position there given is lat. 16° 52′, long. 140° 30′.

Merrill Island (?)—We also venture to give this name to an island of doubtful existence, said to have been discovered by the American ship *Comboy*, whose commander, Capt. Harding T. Merrill, on his voyage from Oahu to Callao, in April, 1832, fell in with it in lat. 16° 38′, long. 141° 0′ W. Neither of these are mentioned by Capt. Lejeune.

Mauruc says it is low, and encloses a lagoon, where it is probable that mother-of-pearl may be found, for the natives wore it as ornaments. There are some cocoa-nut trees, but they are not very abundant. M. Mauruc says that in 1838, in endeavouring to effect a relationship with the natives, he nearly had an outbreak.

Puka-Puka, Henuake, *Honden*, or *Dog Island*, was discovered by Le Maire and Schouten, April 10th, 1616. They described it as clothed with vegetation, and, from what they could judge, the greater part of the island was overflowed at high water. This is certainly not the case now, and therefore it appears to be somewhat raised. It is a coral island with a central lagoon, which can only communicate with the sea at very high tides, by means of two channels on opposite sides of the island. There are no cocoa-nut palms on the island, as was reported by Captain FitzRoy. No traces of inhabitants were perceived, nor is there any fresh water to be found. From the observations of the day, the usual neap tide is 3⅛ ft., and it would give high water, on full and change of the moon, at 2 p.m. The centre of the island is in lat. 14° 50′ S., long. 138° 47′ 36″ W.

Disappointment Islands were discovered by Byron in 1765, but his position is nearly 4° to the West of the correct longitude.

The group consists of two islands, the easternmost *Napuka* (or *Wytoohee*), the other *Tetopoto* (or *Otohoo*). The N.W. point of Napuka is in lat. 14° 9′ 30″ S., long. 141° 17′ 50″ W. The island is formed of islets, connected by a washed coral reef, of irregular shape, with a lagoon having many knolls in it, of various sizes, some 4 or 5 ft. above the surface. The S.E. portion is the largest and most thickly wooded, and contains the greatest number of inhabitants. These were estimated to be about 90 in number, and understood the Tahitian language. They were peculiar, and appeared totally distinct from any others met with in the group, having strong wiry beards and mustaches, and a different physiognomy. There were about 60 in 1861, and they were hostile. The island has some cocoa-nut, bread-fruit, and pandanus trees; the pisonia, tournefourtia, and the shrubs that are common to the Low Islands also grow on it.

Tetopoto, the other island of the group, lies W.N.W., distant 12⅛ miles from Wytoohee, from which it is distinctly visible, like a round knoll. This appearance is owing to the trees upon it, for the land is as low as coral islands usually are. The superficial extent of the island is about a square mile; it has no lagoon, and is well covered with trees. The inhabitants, computed at about 20, are hostile.

Angatau, or *Araktcheef Island* (Aataô, Nanataô, Ahangatou, or Maroupo), was discovered by Bellingshausen in 1820. M. Mauruc was informed by the natives that the pearl oyster was to be found in the lagoon, and that they cultivated taro. He was attacked when a mile off by eight canoes, containing

about 30 men, who were dispersed by a musket-shot. There are about 120 hostile and miserable natives. Kotzebue's position is lat. 15° 51′ 20″ S., long. 140° 50′ 50″ W.

Takume, or *Wolkhonsky Island*, was also discovered by Bellingshausen in 1820. It is low, and encloses a lagoon. People very harmless, and few in number. No passage communicating with the lagoon. Mother-of-pearl tolerably abundant. The village is in lat. 15° 44′ 20″ S., long. 142° 8′ 42″ W.

RAROIA, or *Barclay de Tolly Island*, is another discovery of Bellingshausen's. It is very lightly wooded on the East side, but the North and West are covered with luxuriant vegetation, and especially at 1 mile to the South of the West pass, and at the S.W. point, where the clumps of cocoa-nuts are very remarkable. The West entrance is fit for large ships, except that it has numerous coral patches, and the tide runs 6 and even 8 knots in it. Capt. Lejeune, in the *Cassini*, observed that there was a good anchorage to the S.S.W. of the entrance, 1 mile off, near a village among the cocoa-nut trees. Inhabitants friendly. The village contained about 75 inhabitants in 1873, at the time of the visit of the *Mésange*. A mole was constructed. Cocoa-nut trees were extensively cultivated, but the oyster fishery was stopped. Pigs, fowls, and fish were obtained, and good water from some wells. The village *Gnarumaoa* is in lat. 16° 1′ 25″, long. 142° 27′ 42″ W.; and the S.W. point is in lat. 16° 13′ 37″, long. 142° 32′ 20″ W.

Nihiru, or *Nigeri Island*, was discovered by Captain Bellingshausen in 1819. It lies N. ½ W. and S. ½ E. 7 miles in length. It is inhabited, and well wooded near the S.E. part only. From the South and S.E. points of the island the reef extends a considerable distance, but forms a deep bight just West of the S.E. point. A strong S.W. current was experienced round the S.E. point by the *Mésange*. Its S.W. point is in lat. 16° 44′ 29″ S., long. 142° 53′ 39″ W.

Taenga, *Holt*, or *Yermaloff Island*, was first seen by Captain Turnbull, in the *Margaret*, in 1803. The last name, Yermaloff, or Jermæloff, was given to it by Bellingshausen in 1820. It is very low, and enclosing a lagoon, with which you may communicate by two passages, one in the N.E., which is the smallest, and the other 1½ mile from the South point on the S.W. coast, where a vessel of 200 tons can easily pass. The N.E. coast, and the northern part of the West coast, are well wooded. In the southern part of the island there are only two patches of cocoa-nut trees, one on each side of the S.W. pass. The village is on the southernmost islet. In 1873 the *Mésange* visited it, and found about 30 inhabitants; most of the young men were in the neighbouring islands. Very few provisions. The pass is in lat. 16° 19′ 53″ S., long. 143° 11′ W.

Marutea, or *Furneaux Islands*, were discovered by Cook in 1773. They are very low, and consequently very dangerous, and enclosing a lagoon, which has mother-of-pearl in it. The northern part is wooded; the southern part is but

a rocky flat, forming the belt. In the N.E. part there is a passage, through which a boat might pass. No cocoa-nut trees; few inhabitants. Captain Lejeune places its West point in lat. 16° 54′ 46″ S., long. 143° 19′ 8″ W.; and the N.E. pass 16° 58′ 30″ S., and 143° 5′ 5″ W.

TAHANEA, or *Tchitchagoff Island*, was discovered by Bellingshausen in 1820. It has been very erroneously represented, being two or three times the length shown on the charts. The North side projects considerably in the middle, and the channel between it and Motutunga is not more than 12 or 14 miles, instead of 34 miles. It is thinly inhabited.

At about 16 miles westward from the N.E. point of the island there are three entrances for large ships into the lagoon. They are at equal distances from each other, and about one-quarter of a mile apart. The island is all covered with wood on the North and N.E. sides, but there are few trees on the S.E. coast. The N.W. point is in lat. 16° 46′ 46″ S., long. 144° 58′ 6″ W. The pass is in lat. 16° 51′, long. 144° 39′ 48″; and the S.E. point is in lat. 16° 56′ 46″, long. 144° 34′ 7″.

ANAA, or **Chain Island** (or Anhar), was discovered by Cook in 1769, and it was again seen in his second voyage in 1773.

The principal seat of power in the Low Archipelago, or at least for a large portion of it, has been in this island; and its warlike inhabitants have carried their expeditions to all the islands West of Hao or Bow Island, and conquered them all. It is one of the smallest, yet it is the most thickly-peopled island of the group, possessing the best cultivation, and exporting one quarter the value of the exports of the whole group. It was formerly believed to contain 5,000 inhabitants, or one-half the whole population of the archipelago, which large number was accounted for by the conquest of the other islands, and taking their inhabitants as captives. In 1861 the estimate was 950, and in 1874 Lieut. Mariot estimated it at 1,500. The whole island is one cocoa-nut grove, and estimated to contain, in 1874, 7,000,000 trees. The principal food is fish and cocoa-nuts; the former is caught in large quantities in the lagoon. Cocoa-nut oil is produced, and in 1872 coprath* (dried cocoa-nut) was exported to the amount of 350 tons; in 1873 to 900 tons, and likely to increase in quantity for the following years. Besides these there are plantations of taro. A great change has been brought about in the character of these islanders during the time the Tahitian missionaries have been established in Anaa. Before this period the inhabitants were cannibals. Since the residence of the missionaries they have imbibed better tastes, and the Christian influence has made them more peaceful. This change was first evinced by the treatment of their

* In the production of this article great care has to be taken that none other than ripe nuts, or those which have naturally fallen from the tree, are used, and these must not remain above a month or six weeks after the fall before being used. The coprath dried quickly, is very rich in oil, and seldom mildews.

captives, whom they allowed to return, if they chose, to their own islands; but very many of them had married at Anaa, and become permanent residents there, and few have taken advantage of the permission to return.

After the establishment of the French power over these islands, a Catholic Mission was established on Anaa, at the village of *Tuuhora*, on the North part of the island, where there are some stone chapels; but, notwithstanding the zeal of these propagandists, they have not made much progress till recently. At this village, also, are courts of appeal for the archipelago. It was the only port of the Paumotu group open to foreign vessels in 1877. The inhabitants in 1860 cut a passage through the reef for boats to approach the village, near a small circular islet, which is in lat. 17° 20′ S., long. 145′ 30′ W.

RAEFFSKY ISLANDS.—In 1820 Capt. Bellingshausen discovered an island, whose West extreme is in lat. 16° 43′ S., long. 144° 11′ W., which he named as above. But later observations show that there are three islands, though not connected with each other, close enough to form a group. M. Mauruc says that he saw two of the islands, and was assured of the existence of the third, at the end of 1830.

Tepoto, or *Eliza Island* of Mauruc, is Raeffsky Island of Bellingshausen. It is the easternmost of the three, and is in lat. 16° 42′ S., long. 144° 5′ W.

Tuanake, *Touanagué* of Mauruc, is now uninhabited, and has a small passage for boats to the N.W. Lat. 16° 38′ 42″ S., long. 144° 14′ 49″ W.

Hiti, the *Louise* or *Ofiti* of Mauruc, is the southernmost. Like the others, it is small, and was uninhabited when Mauruc saw it in 1831. Centre, 16° 49′ S., 144° 13′ W.

Haraiki, or *St. Quentin* or *Croker Island*, was discovered by Bonecheo in 1772, and was surveyed by Beechey in 1826. It is 4 miles long in a N.W. and S.E. direction, and its North point is in lat. 17° 26′ S., long. 143° 26′ W. There is a small boat entrance on the S.W. side. It is uninhabited.

Motutunga, or *Adventure Island*, was discovered by Cook in 1773. It is very low, and enclosing a lagoon, with a small passage in the North, fit for a boat; a little mother-of-pearl; some cocoa-nut trees; occasionally inhabited. The N.W. entrance is in lat. 17° 3′ 15″ S., long. 144° 24′ 45″ W.

MAKEMO, or *Phillips Island*, was discovered in the *Margaret*, in 1803. It was called *Koutousoff Island* by Bellingshausen in 1820. According to the latter, it lies W. by N. ¾ N. and E. by S. ¾ S., 32 miles long. According to M. Mauruc it is very low, and encloses a lagoon. The N.E. coast of the island is well wooded. There are two passages into the lagoon, one on the N.E. part, and the other on the S.W. part; they are each divided into three channels by two patches of coral. In the N.E. passage any one of these may be chosen according to the wind; but the ebb sets out with great strength, and sailing vessels should only enter with the flood tide. The anchorage is good, and will be found westward of the reef which bounds the western side

of the pass. The French war-vessel *Mésange* anchored in 7 fathoms, sand and coral, about 2 cables S.S.W. of the wharf which lies abreast the village, of about 100 inhabitants. Pigs, fowls, and good water were found. A second village lies 15 miles westward of the last. There is anchorage in 7 or 8 fathoms in the lagoon, about 2 cables off its mole. This is the residence of the chief, and contains about 50 inhabitants. In proceeding from the N.E. pass to this anchorage, there are numerous shoals requiring careful pilotage to avoid them; it is, however, generally advisable to keep nearer the northern than the southern shore of the lagoon, and when approaching the anchorage to keep about 1 mile from the shore.

The *Mésange*, entering by the N.E. pass, visited and anchored off each of the villages, and then left by the West pass, in which 5 fathoms was found, although the pilot said there was not depth for a vessel drawing over 16 ft. The South part of the island is but a chain of reefs. Of the N.E. pass, the western side of the entrance is in lat. 16° 36′ S., long. 143° 33′ W. High water, full and change, at 3^h. The West passage is in lat. 16° 26′, long. 143° 58′ 4″. The East point of the island is in lat. 16° 38′ 31″ S., long. 143° 20′ 6″ W.

Katiu, or *Saken Island*, was discovered by Bellingshausen in 1822. It is very low, and encloses a lagoon, with two passages, one in the N.W., fit for ships, the other in the S.W., but smaller, communicates with it. Some mother-of-pearl, a few yellow pearls; some cocoa-nut trees; no fixed population. West end, lat. 16° 22′ 37″ S., long. 144° 27′ 46″ W.

Faaiti, or *Miloradowitch Island*, was discovered by Bellingshausen in 1819. It is 15 miles in length, in a W.N.W. and E.S.E. direction, and 5½ miles broad. At the West end of the reef is a large opening, where small vessels may moor, but only small boats can enter the lagoon. It is well wooded in this part, and there are some clumps of trees at the North and N.E., but the South end is only a long reef. There are few cocoa-nut trees, but the natives have of late years planted some. Good water is in greater abundance here than in other isles, but it is difficult to procure. Its N.W. extremity is in lat. 16° 42′ S., long. 145° 22′ W.

FAKARAVA, or *Wittgenstein Island*, is another discovery of Bellingshausen at the same period as the last mentioned. It is still larger, being 32 miles long, N.W. by N. and S.E. by S., by 9½ miles broad. The N.W. end is in lat. 16° 5′ S., long. 145° 40′ W., and the S.E. end in 16° 30′ S., 145° 20′ W.

The island has about 190 inhabitants, and several groves of cocoa-nut trees. The western part is without vegetation. The lagoon is 30 miles long N.N.E. and S.S.W., with very few pearl oysters. It forms an excellent harbour, sheltered from all winds; and the two entrances, one at the N.W., and the other at the S.E. end of the island, will admit large vessels. The N.W. entrance is about 1¼ mile wide, and easy of access; the anchorage is in the lagoon under the N.E. point of the island, 2 cables from the shore, in 5 fathoms. Beating in, care must be taken to avoid the coral banks, which are

very steep-to, but from their light colour are easily seen. In scant winds vessels should not attempt to enter the lagoon except at slack water, as the tidal streams run strong.

The S.E. entrance is narrower and less easy of access than the N.W. entrance, and there are many more coral heads to be avoided, but the starboard or eastern shore on entering affords anchorage. Vessels can navigate the lagoon from one entrance to the other, by carefully avoiding the coral reefs, some of which are awash; black patches will be seen and must be avoided also, as there is very little water on them.

Near the village, on the East point of the channel, Capt. Lejeune built a boat-landing in 1860. The port of Rotoava, on the North side of the island, was opened to foreign vessels in 1881.

Raraka was discovered on October 1st, 1831, by Capt. Ireland, of the brig *Adhemar*. It appeared, when first seen, to be a low island, thickly wooded. On the next day it appeared well covered with trees, not so high as cocoa-nut trees, of which latter, also, there were a few. It was calculated to extend 19 miles in an East and West direction. Like all other islands of the archipelago, it encloses a lagoon.

There has been some misrepresentation on the charts of this island, as it has not been made to extend sufficiently to the South. This may have arisen from the fact that there is a clump of cocoa-nut trees on its S.E. point, on either side of which the reef is bare.

The North and N.E. sides are wooded. In the N.E. part there is a miserable village and a practicable channel for vessels of 100 tons to enter with N.E. winds and leave with S.E. It is in lat. 16° 6′ 33″ S., long. 144° 49′ 25″ W.

The results of a day's observations gave the tides, on full and change of the moon, 2 o'clock, and 3 ft. in height. The shore, however, showed that there were at times very high tides. Some fresh water may be obtained here. The spring or pond is on the West side of the entrance. Water is, however, in no great abundance.

Taiaro, or *Tui-a-ra*, subsequently called King's Island, was discovered by Captain FitzRoy in the *Beagle*, November 13, 1835. It is low, nearly of a circular form, about 2 or 3 miles in diameter, and well covered with trees and shrubs, and has a lagoon of some extent, which, however, has no entrance; a few friendly natives. Its West side is in lat. 15° 43′ 15″ S., long. 144° 38′ 45″ W.

Aratika, or *Carls-Hof Island*, was discovered by Roggewein in 1772. It was identified by Kotzebue in his second voyage and named Carls-Hof—the Court of Charles. It is 8 miles in length and 5 miles in breadth, and its highest point, at the south-western end, is 12 ft. above low-water mark, and is thickly wooded; it is therefore one of the most elevated of the low coral islands. The lagoon abounds with fish (which is poisonous), and has several

small coral knolls in it, though none with vegetation on them. The lagoon has a boat entrance on its West side, and another on the East.

Fresh water is procured from a large pool about 50 ft. in diameter, and of considerable depth; it is about half a mile from the village to the North, and situated within the line of woods. The West point of the island is in lat. 15° 28′ S., long. 145° 39′ 46″ W.

Kawahi, Cavahi, or *Vincennes Island*, is a lagoon island discovered by Captain FitzRoy in the *Beagle*, November 13th, 1835. He saw a number of islets covered with cocoa-nut trees, surrounding a lagoon, but could not delay to examine the South side.

It is 16 miles long by 10 miles wide, its greatest diameter lying North and South. It is a narrow, annular ridge, consisting of many blocks and slabs of coral, which give a clinky sound when struck. The lagoon is the most beautiful in the archipelago, and its entrance also one of the best, with 15 fathoms water. There is an opening into the lagoon on the S.W. side; on its south-eastern part is a high clump of trees, looking like a knoll at a distance. The rest of the island is covered with a growth of bushes, 10 or 12 ft. high. Off the beach, at the N.E. point, is good anchorage near to a large grove of cocoa-nuts. It is in lat. 15° 48′ 15″ S., long. 145° 3′ 34″. To reach it, and to avoid some coral patches lying in the direct route, first steer two miles to N. 38° E. *true*, and then 5½ miles to N.N.E. The bearing of the anchorage from the entrance is N.E. by N. ¾ N. *true*.

PALLISER ISLANDS are the *Schadelyk* or *Pernicious Islands* of Roggewein, 1722. This group is mentioned but slightly by Cook, who named them after his worthy friend, Captain Palliser. Kotzebue made a closer examination of them. "The group consists of a number of small islands, connected by coral reefs, which form a circular chain, and enclose a large area of water. When we had reached the southern point of the East Palliser, we saw ridges stretching 10 miles westward to two small islands, and then, taking a northern direction, united at a considerable distance from the larger ones."

"Cook, from his own account, did not approach near enough to see this ridge, and from a distance mistook the two little woody islands it embraces for the most southerly of a distant cluster, which he calls the *fourth* group of the Palliser Islands. I can maintain that there are only three such groups. The above-mentioned two small islands on the reef lay directly North, and the southern part of the first cluster of the Pallisers was no longer visible. Viewed from this spot, the smaller ones might have been mistaken by us also for part of another group, if we had not previously ascertained that they were connected with the first by means of the reef."

The different members of the group are all separately distinguished, as, indeed, they have no further connection with each other than their proximity.

Toau, or *Elizabeth Island*, is about 24 miles in length, and has anchorage according to Captain FitzRoy's chart, on its West side. There are two large

passages on the East side. It is inhabited and wooded. All the fish in the lagoon are poisonous. Its East end is in lat. 15° 58′ S., long. 145° 48′ W.

Niau, *Faau*, or *Greig Island*, is about 3½ miles North and South, and 5 miles from East to West. It has no entrance to its lagoon, which is only a large salt pond, not exceeding 12 ft. in depth, but which contains an excellent fish of the flavour of salmon. There is abundance of cocoa-nuts, which the inhabitants continue to plant. Its North point is in lat. 16° 8′ 10″ S., and its West point in long. 146° 24′ W.

Kaukura, or Aura Ialand, is of about the same extent and character as Elizabeth Island. It has a boat entrance on the W.N.W. About 30 tons of cocoa-nut oil are made annually. Its West point is in lat. 15° 43′ S., long. 146° 50′ 36″ W.

Apatiki, or *Hagemeister*, was discovered by Captain Hagemeister in 1830. It is scarcely above the surface of the water, and lies between the first and fourth group of the Palliser Islands. Admiral Krusenstern is disposed to believe that this was the *reef* on which the *Margaret* struck in 1803, and that in the interval it had acquired the character of an island instead of a submarine reef, from the growth of the coral. It is triangular in form, its eastern side 18 miles long true North and South, with two entrances through it. Its northern side, without an opening, runs East and West, 20 miles. Its southern side, E.S.E. and W.N.W., has three openings through it, the eastern pass named Pakaka, and the western named Tehere, both navigable for large vessels. In Pakaka Pass there are two buoys moored opposite the village. Its N.E. extremity is in lat. 15° 17′ S., long. 146° 13′ 30″ W.

Arutua, or *Rurick Island* of Kotzebue, is 20 miles in extent, N.N.E. and S.S.W. Its population is of Tahitian origin. It has no channel into the lagoon. Its South point is in lat. 15° 28′ S., long. 146° 49′ W.

Tikei, or *Romanzoff Island*, was discovered April 20th, 1815, by Otto von Kotzebue, and was named after the munificent author of his voyage. He describes it as a small coral island, 3 miles long, N.N.E. and S.S.W.; its whole circumference being not more than 10 miles. It is particularly distinguished by having no lagoon, like most coral islands. It is in lat. 14° 57′ 20″ S., long. 144° 35′ W.

KING GEORGE ISLANDS.—This name is applied by Cook to two islands which had, however, been previously discovered. It may be the *Sondergrond* of Le Maire and Schouten, 1616. The N.E. island, *Takaroa*, or *Tiookea*, was seen by Roggewein, in 1722. It is 15 miles long E.N.E. and W.S.W.; its North point being in about lat. 14° 23′ S., long. 144° 58′ W. There is an entrance for large vessels to the S.W.

Takapoto, or *Oura*, or *Taputa* is the S.W. island, and is 12 miles long N.N.E. and S.S.W. It was seen by Byron in 1765, and is called *Spiridoff*, by Kotzebue. Its South point is in lat. 14° 44′ S., long. 145° 20 W. Its position was corrected in 1859 by the captain of the *Railleur*.

They appeared to Captain Hudson, of the American expedition, to be well inhabited, and have entrances to their lagoons on the West side.

Manihi, or *Waterlandt Island.*—In 1616 Le Maire and Schouten discovered an island 45 miles to the West of Sondergrond, which latter Admiral Krusenstern considers identical with the King George Islands. In 1767 Captain Wilson, in the ship *Duff*, also saw an island in the above situation. Captain Duperrey places *two* islands to the West of the King George group; a second to the S.W. of the former, and the track of Turnbull between the two. In Capt. FitzRoy's chart these two islands are placed in the foregoing positions, so that which is Le Maire's Waterlandt, and the island seen by Wilson, has to be decided. Krusenstern considered that the latter was one of the King George Islands. Captain Duperrey thought the contrary, but without convincing Admiral Krusenstern. The discovery of the second island decided in favour of Duperrey. These two islands were more correctly placed and surveyed by the United States' Exploring Expedition in 1839. Their native names are Manihi and Oahe or Ahii; they lie W. $\frac{3}{4}$ N. and E. $\frac{3}{4}$ S., $8\frac{1}{2}$ miles apart, from reef to reef.

Manihi is, in all probability, the Waterlandt of Schouten and Le Maire, and also Wilson's Island of the *Duff*. There is a large and deep entrance at the S.E. end into the lagoon of Manihi Island, in which the natives stated vessels had often anchored whilst engaged in pearl fishing, but it must have grown up so as to be only fit for boats (1861). Many cocoa-nut trees were seen on the island, and fresh water is to be procured on the S.W. side. The island at this end is upwards of half a mile wide to the lagoon; the coral reef is here quite broad. Soundings are not to be had with 100 fathoms of line 50 feet from the edge of it. The East end of the island lies in lat. 14° 23′ 22″ S., long. 145° 52′ W.

Oahe, or *Ahii*, or *Peacock Island*, has only a small boat entrance into its lagoon on the West side. The coral belt is similar to that last described. It was found to be upwards of half a mile in width, and was covered with the same kind of vegetation as the last. The lagoon is quite shallow; a few inhabitants, in 1861. It was named after the *Peacock*, to show that its position was correctly ascertained by the Exploring Expedition. Its West point is in lat. 14° 33′ S., long. 146° 27′ W. H.M.S. *Topaze* passed it on June 19th, 1867, and found this position quite correct. Wilkes says that there were no cocoa-nut trees, but in 1867 there were a few, though of no great height.

RANGIROA, *Vlieyen*, *Dean Island*, or *Nairsa.*—On April 18, 1616, William Cornelison Schouten and Jacques Le Maire, in the *Unity*, after rounding Cape Horn and touching at Waterlandt, &c., discovered an island, on which they landed, and were assailed by myriads of a sort of black fly, alluded to on page 595, which soon made them quit it, and apply the name of *Fly* (Vliegen) *Island* to it. This is the extensive island in question. Commodore Byron, in 1765, described it under the name of *Prince of Wales*

Island, and as 20 leagues in length. In 1803, the ship *Margaret* reached an island which they called *Dean Island*, but which there is no difficulty in proving is the same.

The very great extent of this island has led to considerable confusion in the early charts and claims to discovery. Several navigators have coasted around the island, but none have described it very fully. It was found by the United States' Expedition to be 66 miles in length. Its West point is in lat. 15° 5′ 15″ S., long. 147° 58′ 34″ W., and its East point by Captains Delamarche and Gizoline (1851), lat. 15° 18′ 7″ S., long. 147° 15′ 13″ W. The positions and the islands are correctly given according to Capt. Powell, H.M.S. *Topaze*, 1867. The natives there acknowledged themselves subjects of Queen Pomare of Tahiti.

The coral reef is even with the water's edge in the southern part, and wooded in the North. The lagoon is 100 miles in circuit. There are abundance of cocoa-nut trees, but little oil is made, and in the lagoon are but few pearl oysters of any size, though small ones are abundant. There are three passages into the lagoon; one in the West, for boats, and two larger ones in the North, Avitoru and Toputa.

The *Avatoru Entrance* to the lagoon, suitable for the largest vessels, is at the N.W. point of the island, and has in its centre a wooded islet. On the eastern side of this passage is a wharf used by small vessels unable to enter the lagoon on account of the currents, and reach the inner anchorage and harbour, situated at the eastern end of *Atimaro Village*, which occupies the S.E. entrance point, and contains about 200 inhabitants. Entering, give the N.E. end of the wooded islet a good berth, and also the village point a berth of 80 or 100 yards.

Tiputa or *Atifareura*, the eastern opening, is narrower, and obstructed by stronger currents than Avatoru entrance, but it is reported practicable for large vessels. There is a bare islet a little westward of the inner part of the passage. The village is situated about half a mile eastward of the entrance, and contains 300 inhabitants, who possess 12 small schooners. A small mole is run out to protect them against the S.E. swell.

Two dangers have been reported in the lagoon, a coral bank 3 miles S.S.E. of the wooded islet at Avatoru, and a bank of $2\frac{3}{4}$ fathoms S. by E. $\frac{1}{2}$ E. from Tiputa entrance.

Makatea, or *Aurora*, or *Metia Island*, was discovered by Roggewein in 1712. Its North end is in lat. 15° 50′ S., long. 148° 13′ 15″ W.

It is a coral island uplifted, exposing its formation distinctly, and as such is very interesting. The perpendicular cliff appears worn into caverns, and its height proved to be 250 ft. The coral shelf was found to be 500 ft. in width, extending on the North side of the island, and gradually diminishing in width until it loses itself at the western end. This island has all the features that one would naturally be led to expect from a low island uplifted. The North,

East, and West sides present a perpendicular cliff or wall, but this character does not prevail on the South side, although it has some high knolls. The North ridge is nearly level, and there is a break through it (by which we ascended to its top) very much like the opening of a lagoon. The North side is concave, and there is found within the indentations between its two points an extensive plain, composed of large masses of limestone and vegetable mould, on which the village is situated, in a luxuriant grove of bread-fruit, cocoa-nut, pandanus, and other trees, similar to those already spoken of as seen on the other islands. There were several copious springs, but the natives said there were no running streams on the island. The upper portion of this island is composed of limestone or compact coral rock, and it has unequivocal marks of having been uplifted at different periods; the cliff, at two different heights, appears to have suffered abrasion by the sea.

On the western side of the island there are several small openings in the encircling reef, through which landing is practicable for boats during strong easterly winds. When between two very wooded summits on the western side of the island, the reef will be found steep-to, and can be approached to within 60 yards, thus avoiding the heavy sea and strong current. There is said to be an anchorage northward of the West point of the island.

The inhabitants have derived very great improvement from the missionaries; in times past they had all war, but now all is peace. Abundance of fruit and vegetables can be purchased. The flies, which are in incredible numbers on all the inhabited islands, are a great nuisance.*

Tikahau, or *Krusenstern Island*, was discovered by Kotzebue, April 24th, 1815. It is of the usual description, the island chain extending from N.N.W. to S.S.E., 15 miles in length, and particularly distinguished by having in the middle of the lagoon a small island thickly overgrown with trees. It has no entrance. There are many cocoa-nut trees and taro plantations. The people have come from Tahiti. The western entrance of the group is placed in lat. 15° S., long. 148° 21′ W.

Matahiva, or *Lazareff Island* (or Malivi), is the westernmost of the islands of the Low Archipelago, and was discovered by Bellingshausen in 1820. It has a boat entrance in the West. It has some trees on it, among which the cocoa-nut may be seen, but has no vegetation in the West; there are some young cocoa-nut plantations. It is inhabited. Its length is 5 miles, and the West point is in lat. 14° 55′ S., long. 148° 45′ W.

As we observed in the outset, many of the geographical particulars above given of the Low Archipelago are derived from the partial surveys and the

* Cecile Island is marked on M. Vincendon-Dumoulin's chart as low, and in lat. 15° 30′ S., long. 148° 20′ W. Can this be the Vesper of Roggewein?

observations made by the French officers on the station. The longitudes are dependent on the position of Motu-uta, a small islet in the roadstead of Papeite, Tahiti, being in long. 149° 34′ 20·6″ W. The first of these were made on the western groups, by M. Adam Kulczycki, and were discussed by M. Vincendon-Dumoulin. These showed very large errors in the charts. The subsequent observations are mentioned before. The representations, though not complete, are now sufficiently exact for navigation, and all the groups and islands are named, so that they may be traversed with the caution imperatively demanded by their peculiar and dangerous character. There has been some confusion in the nomenclature of some islands of the group; the foregoing description has been made to correspond with the latest charts.

CHAPTER XII.

SOCIETY ISLANDS.

This important group of islands, which in some respects is the principal of the South Pacific, consists, as is well known, of the celebrated Island of Tahiti and several other smaller dependents. There is no spot on the globe which has received a more lively attention than this, from the great experiment of the civilization of man by means of religious influence. The islands themselves are not so important to the rest of the world.

There would appear to be little doubt but that Tahiti was first seen by the expedition under Pedro Fernandez de Quiros, in 1606. This voyage has, as it ought to be, become one of the most famous ever performed; inasmuch as the discoveries made in it have been verified by subsequent observations.

It would appear that Quiros went as pilot mayor in Mendaña's famous expedition across the Pacific, in and subsequent to 1595, and on his return obtained of King Philip III. an order from the Conde de Monterey, viceroy of Peru, to furnish him with two ships for the purpose of extending the former discoveries. Two ships, Quiros commanding the first, and Luis Valdez de Torres, the *Almiranta*, the second; besides, there was a small vessel called a zabra. They left Callao December 21st, 1605, and after making several discoveries, on February 10th, 1606, the weather being rainy, "they saw a low island, with a point to the S.E., which was covered with palm trees." This island has no name in the account given by Torres, or by Torquemada, but in the list of Quiros it is called *La Sagittaria*. Almost all particulars coincide with that of the large and important island now under consideration. Quiros must therefore have the honour of discovering Tahiti.

Like many other Spanish discoveries, this was unknown or unnoticed by the rest of the world, so that when the ship sent by George III. to make discoveries in the South Seas, the *Dolphin*, under Captain Wallis, reached Tahiti on June 19th, 1767, it was supposed to be the primary discovery, and it was named *King George Island*. He made it on the S.E. side, and was soon surrounded with a great multitude of canoes, the natives being very

friendly, but thievish, which led to a slight skirmish. Captain Wallis sailed along its eastern side, and anchored off its N.E. shore. On the 23rd he weighed, and discovered Matavai Bay; and, in passing it, struck on the detached coral bank, now called *Dolphin Bank*. They, however, got safely off, and anchored in the bay, when Lieutenant Furneaux landed, and took formal possession in the name of George III., by hoisting a flag. This ceremony has been continued since the time when the Pope claimed all countries inhabited by heathens. The flag was soon taken down by the natives, and was made by them into a badge of sovereignty for many years afterwards.

On April 2nd, 1768, M. de Bougainville came hither in the *Boudeuse* frigate and a store-ship, and quitted on the 14th, naming it *Nouvelle Cythère*.

The next visit is perhaps the most important, as it made the world much more intimately acquainted with this group than those previously, and besides filled up one of the most important vacancies of science, and of obtaining a more complete knowledge of the figure of the earth. It had been recommended by the learned of Europe that the rare occurrence of the transit of Venus across the sun's disc should be observed at points the greatest possible distance apart. For this purpose Lieutenant James Cook, who from his great ability had been promoted, was sent in the *Endeavour*, with an efficient staff of scientific observers, among whom was Mr. (afterwards Sir Joseph) Banks, to Wallis's discovery, arriving at Matavai Bay April 12th, 1769. A small fort was erected near the northernmost point of the island, and the transit observed on June 3rd following; the point thus becoming one of the then best-determined positions in the western hemisphere, and was named Point Venus. Cook surveyed the chief island, and discovered several of the north-western group, to which he gave the appellation of Society Islands.

The occupation of the Falkland Islands in 1765-66, led the Spanish Government to suspect that the English would establish themselves in the South Seas. Accordingly orders were sent to Don Manuel de Amat, viceroy of Lima, to forward an expedition to Tahiti. Don Domingo Bonecheo was accordingly sent, in the *Aguila* frigate, reaching Tahiti November 10th, 1772. He gave it the name of *Amat* or *Tagiti*. His report on returning caused the attempt to colonize; for in September, 1774, Bonecheo was again sent, with two Franciscan missionaries, and other means of establishing a settlement. Between these visits Cook had, in company with Captain Furneaux, in the *Resolution* and *Endeavour*, again visited the island, August, 1773, and heard of the Spaniards' visit, though he mistakes the commander. Capt. Bonecheo made a minute examination of the island, but unfortunately died January 26th, 1775, and was buried at the foot of a cross they had erected on first landing. Cook visited it in his last voyage, in August, 1777, and found the house, cross, &c., of the Spaniards, carefully preserved.

The subsequent events which distinguish Tahiti stand prominent, and are familiar to most. Eleven years passed after Cook's last visit without any

intercourse between Europe and Tahiti. Lieut. Bligh, who had also sailed with Cook as master, came hither in command of the *Bounty*, which was commissioned by George III. to transport the bread-fruit tree to the British West India Islands. She arrived at Matavai October 26th, 1788, and her five months' sojourn allowed the crew to form connexions with the native women. This has been assigned as a sole reason for the ensuing catastrophe, but it is more to be attributed to the commander's harshness and severity The subsequent mutiny and return of the mutineers to Tahiti, June 6th, and a second time September 22nd, 1789, is well known

The *Pandora* frigate, commanded by Capt. Edwards, was sent in search of the *Bounty* and her mutineers, and arrived here March 23rd, 1791, and took away those who had remained, fourteen in number, three of whom were afterwards executed at Spithead. Vancouver also visited Tahiti in this year. Thus most of the great voyages to which we owe our first knowledge of the Pacific Islands have made this one point.

The foregoing voyages, made by order of George III., excited wonderful attention in England, and one result of them was the formation of a missionary society in London, whose first operation was the outfit of a vessel, the *Duff*, which was to carry missionaries and the Bible into these newly-discovered islands. The *Duff* sailed from the Thames August 10th, 1796, and after visiting the groups to the eastward arrived at Tahiti, Sunday, March 5th, 1797. Perhaps the very success of these missions led to their downfall. The exclusive system introduced, and the, perhaps, harsh and intolerant measures proposed and effected, carried their own retribution. The success of the French mission in the Gambier Islands, and other places, induced the Romish propagandists to send two priests MM. L. J. Laval and F. Caret, to Tahiti, in order to establish their rule of faith in these islands. This was fiercely opposed by those at the head of the existing order of theological opinions, and the consequence was that these two persons with a third, A. Vincent, a carpenter, were forcibly deported from Tahiti. This aggression against French subjects naturally drew down the vengeance of the government; and the frigate *La Venus*, under Admiral Du Petit Thouars, arrived and demanded 2,000 piasters as the expense of their voyage to France—perhaps a *little* act for a great nation—and obliged Queen Pomare to sign a treaty which allowed liberty to all French subjects. This was in 1842.

The ice once broken, and the French power having been established in the Marquesas, it was not difficult to find a pretext to lay stronger hold on this important island, in some points the key of the Pacific. After various controversies, backed by the presence of a powerful fleet, Capt. Bruat, early in January, 1844, landed a strong force, and hauled down Queen Pomare's standard, and hoisted the French flag, taking possession of the island in the name of Louis Philippe, the king of the French. After this they were nominally under the French *protectorate*, until the year 1880, when King

Pomare V. finally renounced, in favour of France, all his rights and authority over the Society Islands and their dependencies, and they are consequently now French possessions.

The French possessions of Oceania at present consist of the Tahitian Islands, the Low Archipelago or Paumotu or Tuamotu group, Tubuai, Ravaivai, Rapa, the Gambier group, and the Marquesas Islands; the total population of these islands amounting to about 25,000 in 1881. These are all nominally subject to the same general laws, regulations, and duties, but Papiete has nearly the whole of the foreign trade.*

The ports open to foreign commerce at Tahiti and its dependencies, are Papiete, Taonoa, Papeuriri, and Port Phaeton (on the South side of the isthmus), at Tahiti; Papetoaï, at Moorea or Eimeo; Rotoava on the North side of Fakarava in the Paumotu group; the port of Tubuai about 330 miles southward of Tahiti; Rikitea on the East side of Mangarava in the Gambier group; and Taiohae on the S.E. side of Nukahiva in the Marquesas group, at each of which a French Resident is stationed. But no foreign-going ship may, unless by special permission or a case of necessity, anchor in any of the ports of the islands subject to the French, besides those mentioned above; while the coasting trade of these islands is exclusively reserved to vessels carrying the French flag. A local regulation, however, authorizes the issue, at Papiete, of special license to foreign vessels to enter and load oranges for exportation in other ports of Tahiti and Moorea. But practically the coasting trade is carried on by Tahitian vessels.

At Tahiti, pilotage is obligatory and is charged on vessels both on entering and leaving, whether they take a pilot or not. These charges are for the first 100 tons of a ship's burthen at the rate of 4 francs per 10 tons; for the 300 following, 3½ francs per 10 tons; for the 100 tons following, 3 francs per 10 tons, and all above that at the rate of 1½ franc the 10 tons. These dues are not charged on vessels entering for repairs only, and not engaged in commerce here. A general duty of 12 per cent. is charged on imports, and an additional duty on fermented liquors; a duty of 40 francs per ton is levied on all pearl shell exported.

Cotton planting, for which the islands are well suited, and the manufacture of cocoa-nut oil, are the chief occupations of the Europeans settled on these islands; the export of cotton will probably supplant that of oil, as there is a greater demand for it. Trade is carried on partly in money and partly in Manchester goods. Foreigners experience great difficulty in obtaining land; the natives, being unwilling to sell, lease it for short periods only. There is monthly mail communication with San Francisco by sailing vessels.

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* The French keep *their* Sunday, which is a day *before* that usually and formerly kept. The missionaries came round the Cape of Good Hope, and thus lost a day to what it would have been had they rounded Cape Horn.

Of exports, cotton is the most important. In the year 1882 the total export of that article from Tahiti was valued at £53,025; 1,284 tons of *coprah*, or dried cocoa-nut kernels, exported during the same year, were valued at £15,408; pearl shells, 471 tons, valued at £42,390; edible fungus for China, at £1,395; and oranges at £2,043. The total value of exports for the year reached about £127,000; the greater proportion of this was the production of Tahiti itself, but the coprah, oil, and shells, come chiefly from the Low Archipelago, and other surrounding islands. As illustrating the increasing importance of Tahiti, we may state, that the average annual value of exports have increased from £8,442 between the years 1845 and 1849, to £26,000 between the years 1860 and 1864, and to about £116,000 between the years 1878 and 1882. The imports from foreign countries amounted to about £173,000 in 1882, much of this being re-exported to the other islands.

In 1882 the total number of merchant vessels entering the port was 254, with a total tonnage of 24,972, of which 14, with a tonnage of 2,168, were British.

The Leeward Islands, or those independent of the French Government, are Huahine, Raiatea, and Bolabola. Each of these is ruled by a sovereign elected by the people. The trade with these islands has considerably developed of late, particularly shown in their increased direct trade with New Zealand. The population of this group amounted to about 5,000 in 1881.

The *natives* have been so very frequently described, that it is needless to say much here. They will not compare with those of the Sandwich Islands, neither will Tahiti itself with the latter for commercial activity or importance; they are indolent and luxurious, easily susceptible of external impressions.

On Raiatea there is an institution for the education of native missionaries under the management of the London Missionary Society. There are several schools and churches on each of the islands, and all the natives are Protestants.

Climate and Winds.—In the prefatory remarks in the preceding chapter we have cited some observations by Capt. FitzRoy, as to the variableness of what would be expected to be the regular trade winds in this latitude. The ensuing extract from the narrative of the first voyage made by the great circumnavigator Cook, in 1779, places the matter in clearer light.

"Though this and the neighbouring islands lie within the Tropic of Capricorn, yet the heat is not troublesome, nor did the winds blow constantly from the East. We had frequently a fresh gale from the S.W. for two or three days, and sometimes, though very seldom, from the N.W. Tupia reported that south-westerly winds prevail in October, November, and December, and we have no doubt of the fact. When the winds are variable, they are always accompanied by a swell from the S.W. or W.S.W.; there is also a swell from the same points when it is calm, and the atmosphere loaded with clouds, which is a sure indication that the winds are variable, or westerly out at sea, for with the settled trade wind the weather is clear.

"The meeting with westerly winds within the general limits of the eastern

trade has induced some navigators to suppose that they were near some large tract of land, of which, however, I think they are no indication. It has been found, both by us and the *Dolphin*, that the trade wind in these parts does not extend farther to the South than 20°, beyond which we generally found a gale from the westward; and it is reasonable to suppose, that when these winds blow strong, they will drive back the easterly wind, and consequently encroach upon the limits within which they constantly blow, and thus necessarily produce variable winds, as either happens to prevail, and a south-westerly swell. This supposition is the more probable, as it is well known that the trade winds blow but faintly for some distance within their limits, and therefore may be more easily stopped or repelled by a wind in the contrary direction; it is also well known that the limits of the trade winds vary not only at different seasons of the year, but sometimes at the same season in different years.

"There is therefore no reason to suppose that south-westerly winds, within these limits, are caused by the vicinity of large tracts of land, especially as they are always accompanied with a large swell in the same direction in which they blow, and we find a much greater surf beating upon the shores of the S.W. side of the islands that are just situated within the limits of the trade wind than upon any other part of them."

The following is from the more extended observations of the French officers resident there, and who have surveyed the N.W. portions of Tahiti:—

The year may be divided into three seasons, characterized by the prevalent wind. 1. The season of S.E. winds, May to August; 2. Of easterly winds, from September to November, and part of December, which is the finest season of the year; and 3. The bad or rainy season, with northerly winds, from the middle of December to March or April.

The S.E. trade winds, on reaching Tahiti, are divided into two branches, by the peninsula of Taiarapu and the mountains, of which that passing to the N.E. blows regularly; but that which continues along the S.W. is impeded by the island of Moorea, and is deflected by it towards Tahiti, reaching it as a S.W. or West, or even as a N.W. wind, according to the force of the trade wind. This fact must be taken into consideration in making the Bay of Papiete.

The extent of the zone of calms, caused by the mountains, also varies in different parts of the day, and with the strength of the breeze.

The *Tides* about these islands are perhaps as inconsiderable as in any part of the world. A South or S. by W. moon makes high water in the Bay of Matavai in Tahiti; but the water very seldom rises perpendicularly above 10 or 12 inches.

A few words may be said as to the names of the islands. The first appellations, La Sagittaria by Quiros, King George Island by Wallis, Nouvelle Cythére by Bougainville, or Amat of Bonecheo, have all been abandoned for the native name, as is most proper it should be in all cases. Capt. Cook was the first to give it its correct appellation, *Otaheite*, as he spells it.

"Thus Otaheite is to be pronounced as to rhyme with the adjective *mighty*." Subsequently an important change was found necessary, and in this the consonants were used as in French and German, and the vowels as in Italian. Thus the new form of the word is O Tahiti, or generally without the prefixed article; and as the printed language has in a great degree become the standard, *Tahiti*, as is there used, has been here preferred, and is well known.

MAITEA, or Osnaburgh Island, is the easternmost of the group. It was discovered by Wallis in the *Dolphin*, in 1767, and he gave it the second of the above names; though there seems to be but little doubt that it is the same called by Quiros *Dezena*, because it was the tenth discovery made in his voyage. Bougainville saw it in 1768, and called it *Le Boudoir*, or *Pic de la Boudeuse;* and Benecheo, previously mentioned, called it *San Cristobal.* The native name is to be preferred to all these. It is high, round, and not more than 7 miles in its greatest extent; its greatest elevation is 1,597 ft., and it is in lat. 17° 53′ S., long. 148° 5′ W. Its North side is remarkably steep. The South side, where the declivity from the hills is more gradual, is, or was, the chief place of residence of the natives; but the North side, from the very summit down to the sea, is so steep, that it can afford no support to the inhabitants. The eastern part is very pleasant, cocoa-nut and other trees abounding. Near the East end are two remarkable rocks, and a reef runs off to the eastward about 1½ mile.

The yacht *Sunbeam* called here in 1876, and a boat, with some difficulty, landed at a little cove close to some huts. The natives were very hospitable, and could speak a little English.*

TAHITI is about 32 miles long N.W., and S.E., and is an elongated range of high land, which, being interrupted in one part, forms an isthmus about 3 miles in breadth, which connects the two peninsulas. From a low margin of sea-coast the land rises to a very considerable height on both extremities of the island, where some highly fertile plains or valleys intersect the ranges in different parts. The loftiest mountain, which is in the northern peninsula, is *Orohena*, which, according to the French, is 7,339 ft. high; *Pito Hiti* is the next, 6,996 ft.; and *Vaorai*, or *Aorai*, 6,771 ft. These high mountains are sometimes called the *Diadem.* From these peaks ridges diverge to all parts of the coast; they are precipitous, and generally narrow, in places a mere edge.

Of late years the lower lands of Tahiti have undergone considerable change by the introduction of the guava shrub, brought from Norfolk Island about 70 years since. This has flourished in an extraordinary manner, and has now usurped the soil to a very great extent. For miles the woodlands and bush are composed almost entirely of this shrub, which bears a profusion of large and delicious fruit.

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* See "A Voyage in the Sunbeam," by Lady A. Brassey, 1878, pp. 219—225.

The island is nearly or quite surrounded by an excellent broad road, called the Broom Road, which, overshadowed with trees, affords a delightful means of visiting the different settlements distributed around it. In the code of laws adopted by Pomare, the punishment for getting intoxicated was making so many feet of this road. The population of Tahiti, by the census of 1881, amounted to 9,380.

Outside the low belt of land at the foot of the mountains, a coral reef encircles the island at the distance of 2 or 3 miles, and within this are several excellent harbours, where the sea is constantly tranquil, but the best and the one principally used is Matavai Bay, on the North side.

All voyagers unite in praise of the beautiful appearance of Tahiti. It is sufficiently high to be seen at 45 miles distance, when, if to the East or West, it appears like two islands, the low connecting isthmus not being seen.

Tahiti consists of two peninsulas, which the natives distinguish by the names of *Opoureonu* (Cook), or Tahiti-Nui (Great Tahiti), and *Tiarraboo* or *Taiarapu*, or Tahiti-Iti (Little Tahiti), united by the isthmus of *Taravau*. On the North side of the former is the chief place of the group.

POINT VENUS, the northern point of Tahiti, is the most important geographical site in the Pacific Ocean, as it has been the point most accurately determined, or at least has had more extensive series of observations made on it than elsewhere. Cook's first expedition led to this spot to observe the transit of Venus, in 1769, as previously stated, and here the great navigator and Mr. Green, the astronomer, observed that occurrence. From these observations Mr. Wales deduces its position as long. 149° 26′ 15″ W. From the observations made during his second voyage, Mr. Bayley deduces it as long. 149° 28′ 23″ W., nearly identical with what Capt. Beechey made it in 1826.

In the first chronometrical chain of distances carried round the world which was done by Capt. FitzRoy, in H.M.S. *Beagle*, in measuring eastward it was 149° 26′ 14″, and westward 149° 34′ 30″. Thus the entire circumference was made to be 8′ 16″ in excess, and, taking Tahiti as the point where this correction would be best made, the mean would be 149° 30′ 25″. But it has been shown that Valparaiso, one of the points in the *Beagle's* chain, is 4′ 2″ in excess, if that correction is applied to the westerly measurement, it will make it exactly the same as Bayley and Beechey, 149° 28′ 21′. The French give the longitude of the new lighthouse as 1′ in excess of the last position.

There is a small church and a fort on the point, and the coral reef extends one-third of a mile off the point.

Near the point lies the village of Matavai, inhabited by several white settlers, each in his little cottage, with its blooming garden around it, the entire scene being almost sufficient to captivate a European.

LIGHTHOUSE.—Near its extremity was the old lighthouse, established in 1856, which was in charge of an old French veteran, and near it is still shown

the tamarind tree, planted by Capt. Cook, close to the spot where he completed his important labours. But on January 1st, 1868, a new lighthouse was first illuminated. It is a square white tower, 72 ft. high, and from it is shown a *fixed bright* light, elevated 82 ft. above the sea, and visible 15 miles off, between E. ½ S. and S.W. by W. ½ W.

Artémise Bank, of 2¼ fathoms, described hereafter, lies E. ⅔ S. from Venus Point light, distant 9 miles, and a mile off shore. When coming from the South or S.E., on opening the light, which is obscured over the bank, a vessel should not steer to the West of North until the light bears S.W. by W. ¼ W., when she may alter course to West, passing to the northward of all the dangers. By day, a good mark is Eimeo open of Point Venus.

MATAVAI BAY lies to the westward of Point Venus, and was called *Port Royal Harbour* by its discoverer, Wallis, in 1767, but this has been superseded by its native name. To the West of the point is a coral bank, which is separated from it by a very narrow channel; and it was upon this bank, which has only 13 ft. on it in places, that Wallis's ship struck as he entered the bay, hence it is called *Dolphin Bank*. The S.W. limit of the bay is at the *Tahara*, or *West Bluff*, surmounted by *One Tree Hill*, about a mile from Point Venus. There are some detached spots off the West Bluff, and to the S.W. of Dolphin Bank, with 18 and 20 ft. water on them. One is called *Banana Reef*, another *Pooreo Reef*, by Capt. Beechey.

Papawa Harbour commences about a mile W.S.W. of the West Bluff, and is formed to seaward by the usual line of shore reef, just level with the water. Outside this the water becomes unfathomable immediately. The village of Papawa lines the shore of the harbour, which is about a mile in length, East and West.

TOANOA HARBOUR adjoins it on the West, and its entrance is formed by an opening through the outer reef. Capt. Beechey surveyed it in 1826, and has given directions for it, recited beneath. There would appear to be an increase of depth here since that survey, either from volcanic action or from the wearing away of the coral banks, for Capt. Sir Edward Belcher states that in 1840 ships might ride on the spot where the consul's house stood in 1826. At the latter period the channel which leads to Papiete from it was considered impracticable, but in 1836 the French frigate *L'Artémise*, under Capt. Laplace, entered by it, and it has since become the common entrance to Papiete.

The ensuing directions for these harbours on the North side of Tahiti are chiefly taken from those given by Capt. Beechey, in the voyage of the *Blossom*:—

In clear weather the mountains of Otaheite may be seen 90 miles from deck. The ports most frequented are situated on the North side of the island, and may be approached without difficulty when the trade wind is blowing. It, however, sometimes happens in the winter months that the trade wind is interrupted by breezes from the N.W. and West, and at others

that calms and unsettled weather prevail. At such times avoid getting into the bay between Otaheite and Tiarraboo, especially on the S.W. side of the island, as the swell rolls in heavily upon the shore, and there is no anchorage outside the reefs.

Arrived within a few miles of the north-eastern part of Otaheite, several points covered with cocoa-nut trees will be seen stretching from the foot of the hills. One of these is Point Venus, and may be known by the lighthouse and One Tree Hill, which, with the exception of the western extremity of the island, is the last bluff headland upon this part of the coast.

Matavai Bay, on the south-western side of Point Venus, may be considered a safe anchorage from April to December; but during the remainder of the year the trade is liable to interruptions from westerly winds, which blow directly into Matavai, and occasion a high sea. The protection to the anchorage is afforded by Point Venus and Dolphin Shoal, a coral bank, with only $2\frac{1}{4}$ fathoms upon its shallowest part. Between it and Point Venus there is a channel about 50 yards wide, with 17, 15, and 10 fathoms close to the reef; and by anchoring a boat on the edge of the shoal, a vessel may enter with perfect safety, provided the breeze be fair. It is, however, better to pass to the southward of the bank, which may be ascertained by two remarkable cocoa-nut trees on the E.N.E. being seen, to the southward of the European built house on the beach, bearing E. by N., and haul round it towards the anchorage, taking care not to get to leeward, so as to bring the N.E. bluff of One Tree Hill to bear to the southward of S.E., as there are several coral banks in that direction. Anchor in $8\frac{1}{2}$ or 9 fathoms, mud, off old Pomare's house, taking care of the reef that lies off that part of the shore.

To the westward of Matavai there are three good harbours, Papawa, Toanoa (Tau-Noa), and Papiete, of which the latter is the largest and most frequented. The others, however, are the most healthy. The entrances to all are extremely narrow, and a stranger ought to take a pilot on board; but he should bear in mind that some of the persons who act in that capacity, though well acquainted with the channels, understand very little about navigating a vessel.

Toanoa is 4 miles West of Matavai, and may be known by a remarkable rugged mountain, which will be seen through a deep valley when abreast of it. When near, this mountain is very conspicuous, and at night is a good guide to the entrance.

The channel into Toanoa is only 330 yards wide; off the eastern side of the passage there is a rock, upon which the sea sometimes breaks, lying N.W. 60 fathoms from the breakers, and another on the *inner* side of the opposite reef. Neither of these rocks, however, narrow the channel much, and are only dangerous in the event of the wind breaking the ship off, or in rounding the reefs closely. With a fine wind sail boldly in, keeping mid-channel, and clewing all up, allow the ship to shoot into a berth, about 2 cables' lengths from the

shore, in 13 or 14 fathoms. Here she must await until the wind falls, and then tow into the harbour; or if the wind be off the land, set fore and aft sails, and keep the boats ready with lines in them.

There are three channels to the inner harbour, of which the two South ones are only frequented, on account of the currents running strong through that to the northward. Perhaps the centre channel, though scarcely broader than a frigate, had better be used going in, and the South coming out. In the centre channel there is 8 to 12 fathoms water; but in the southern one a shoal extends from the shore, which renders it necessary to keep close to the rock. Anchor in $8\frac{1}{2}$ fathoms, about midway between the outer reef and the shore, opposite some cottages; and moor head and stern by fastening cables to the trees on shores, and carrying out the small bower close to the outer reef.

To proceed to sea, it is necessary to warp into the outer anchorage, after the sea breeze has done in the evening, or very early in the morning before it sets in, and push through the channel before the current makes strong. In all these entrances the current sets out in the daytime, sometimes at the rate of 2 or 3 knots, and rather sweeps over the reef to the leeward. There is another entrance to Toanoa from Papiete, but that just described is the most convenient.

Two *beacons*, erected on the shore near the centre of the harbour, in line S.E. $\frac{1}{2}$ S. lead between the reefs into Toanoa Harbour, and the channels leading hence to the westward are marked by beacons on the detached reefs, and also on the projecting points of the coast reefs and the barrier reefs.

PAPIETE, or *Papeete*.—Two miles to the westward of Toanoa is the harbour of Papiete, capable of containing at least thirty vessels. The entrance is even narrower than that at Toanoa, being only 320 ft. in the clear, and has a bar with only $4\frac{1}{4}$ fathoms on it. The current here sets out faster than through the channel to the northward, and in blowing weather the sea breaks quite across. This is also a more intricate and dangerous channel than the other; and the only way for a stranger to ensure safety, previously to the leading marks being established, was to moor a boat in the middle of the channel. There are no good marks for this spot: but as a general remark keep about 40 yards from the western extremity of two rocks which lie 80 yards off the dry part of the eastern reef. These two rocks have only $1\frac{1}{2}$ fathom upon them, and generally break. There is another rock about 60 yards North of the eastern reef, but this lies out of the channel. On the western side of the channel there is a shoal, with only $1\frac{3}{4}$ fathom water upon it, which extends midway between the dry reefs. From this description it is evident that a pilot is advisable for this port, and that the boats should be in readiness to tow or run out kedges as required.

For entering Papiete Harbour, the leading marks consist of two large white wooden obelisks, which are most conspicuous, one on Soaotoi Reef, and the other on shore, and when in line bearing S. by E. $\frac{1}{8}$ E., lead mid-channel

through the entrance. *Buoys*, coloured white, are placed in positions to mark the western edge of the reef on the East side of the entrance to the harbour, and the 4¼-fathoms patch, situated about 3 cables S.E. of the entrance. There is no difficulty with these aids to navigation in entering without a pilot.—H.M.S. *Alert*, 1880.

A coral head in course of formation, and having 5 fathoms water, has been found in Papieté pass. This head is situated with the pyramids in line, and is about 30 yards southward of the intersection of the line of the beacons with the line of the pyramids.—*Annonce Hydrographique*, 1878.

Lights.—By night the entrance is facilitated by two *red* lights in one, bearing S.E. ½ S., the lower one on the corner of l'Embuscade Battery, the other on a white pyramid, 20 ft. high, on the side of a hill. But these lights cannot be depended on. By day the white pyramid and a white mark on the hill, in line S.E. ½ S., lead in.

After the entrance is passed, steer S.E. ½ S., until the first rock on the inside, bearing S.E. by S., one-eighth of a mile from the eastern dry reef, is passed; then haul towards the missionary church, and beat up the anchorage between the shore, which may be approached within half a cable's length, and the reefs which extend from Motu-uta, Ile de la Reine, or Low Island towards the S.W There is a flagstaff on the South point of Motu-uta. These reefs will be seen, and may be approached as close as convenient. Another reef, named *Soaotoi*, lies S. ¾ E., 3 cables from the entrance; but with the trade wind this will be weathered. If it be necessary, the Motu may be passed to the eastward; but the channel is very narrow. The detached reefs are marked by beacons on their outer edges.

Papiete is a very convenient harbour in many respects, but it is subject to calms and much hot weather, in consequence of its being rather to leeward, and the trade wind being obstructed by woods of cocoa-nut trees.

The tides in all these harbours are very irregular. It is generally high water at half an hour after noon every day, and low water at six in the morning, but it only varies about a foot. Respecting the tides, see some preceding remarks on p. 631.

Papiete, the seat of government of the French possessions of Oceania, and the chief port, stands at the foot of the highest mountains of the island; in 1881 it contained about 2,000 inhabitants. The ground here is level, but there is not much space between it and the foot of the mountains. It is covered with the richest and most beautiful vegetation. It is a town of modern construction, with some hotels and other buildings, erected with very little order in the midst of orange trees, cocoa-nuts, and guavas, which embellish the shore, that extends in a semicircle around the road. The aspect in general is extremely pleasant and picturesque. The background is filled up with a number of pinnacled mountains, jutting in a great variety of forms.

At the back of Papiete is the village of *Amelie*, a single street of houses or

cottages in the European style, built of coral rocks, and so constructed as to be capable of being defended. On the height over the village is the block-house, a wooden building, one of six which protect the town.

The *patent slip* at Papiete will take a vessel of 600 tons, the heaving down quay being adapted to careening vessels of a far larger size. Fresh water of good quality can be got free of charge at the watering quay.

Since September, 1st, 1878, all foreign-going vessels entering Papiete pay light dues at the rate of 25 centimes per ton every voyage, but vessels putting in in distress are exempt. Since 1882 a further charge of 15 centimes per ton has been levied for the sanitary visit upon arrival.

Coal.—The French Government keep a large stock of Australian coal on Fareute Point, on the northern side of the harbour; here vessels can take up a position alongside the coal sheds. A local company also supplied coal, at £2 12s. 6d. a ton, in 1880.

Captain Powell, R.N., of H.M.S. *Topaze*, who came here in June, 1867, says:—The harbour of Papiete is commodious and snug, but the passage into it through the coral reef is narrow and intricate, and it is advisable to have a pilot. Excellent water can be obtained from pipes laid to the end of the pier, and fresh provisions, stores, and supplies of various kinds can be procured, but the price is large.

The French encourage commerce and agriculture, which are almost entirely engrossed by the English; and the authorities have conceded considerable privileges to an English company, who have undertaken a large cotton and coffee plantation. The company employs 1,200 people, consisting of Chinamen and natives of other islands, and large quantities of cotton have been raised by them and others.

The French appear to be very liberal in their government, and the natives have only to pay a small capitation tax, in default of which they give so many days' work. The protestant religion is not interfered with, and the missionary schools are encouraged; order is preserved, and the only restrictions on the natives are for their own benefit. On comparing the scale of this island with that of others where European influence is not felt, I am of opinion that the presence of the French in Tahiti has been very beneficial.

A vessel coming from the East, and finding that the eastern breeze does not reach Papiete, should bear towards Moorea, and then approach Papiete on a S.E. course. Otherwise this failure of the wind might be dangerous in causing the ship to be drifted on to the reef. If the East or N.E. wind is well established, it may be better to enter by the Tau-Noa channel to the N.E., but it must be under the pilot's direction. In leaving, too, it will be best to pass to the North of Moorea, to get in the true trade, and to avoid the calms and uncertain breezes.

There is another entrance which may be used, that of *Taapuna*, on the West coast, about 5½ miles around the reef to the S.W. The direction of this

pass is East, true, but it is dangerous from the rapidity of the currents and the swell beating on to it, and is very narrow.

The Bay of Punaavia is 1½ mile South of Taapuna, on the S.E. side of which is the Point of Punaavia; on it is a block-house, towards which the current always runs. This is occasioned by the drift of the water accumulated in the interior of the reef extending towards Paea, 4 miles to the southward.

Mr. Bennett, in his whaling voyage, went round the island:—"On the S.W. side of the island I noticed the numerous caverns which penetrate the base of the precipitous cliffs that form this portion of the coast. One of these caverns which we inspected was situated at the base of a mural cliff, of 200 ft. high, and its face clothed with ferns and other elegant verdure. The mouth of the cavern formed a large arch; the bottom was occupied by a sheet of fresh water, produced by infiltration through the rock. I also noticed here a number of springs of fresh water, that rise from the midst of the sea, at greater or less distances from the shore. Their situation is marked by small eddies or whirls on the smooth surface of the sea over the coral reef; and upon some of these the natives have placed bamboos, with apertures in their sides, through which the fresh water flows as from a pump. When fishing on the coast in their canoes, it is not unusual for the natives to dive beneath the surface of the sea, and quench their thirst at these fresh water springs. The cause of their existence is of course simple, although the effect is somewhat extraordinary."

The great morai of Papawa, at the S.W. part of the larger peninsula, described by Sir Joseph Banks at the time of Cook's first voyage, was then nearly perfect. It is an enormous pile of stone work, of a pyramidical form, on a rectangular base, 270 ft. long, and 94 ft. wide; the ten steps by which it rises are 6 and 5 ft. in height. The labour required to collect this mass of stones and coral blocks must have been enormous. Since Cook's visit it is much dilapidated, and is now about 40 ft. high, and the sides obliterated. It has been taken by conquest, and thus left to decay since the earlier visits of Europeans.

The coral reef is interrupted in front of the small bay which makes up to Papawa, and the surf dashes with some violence against the shore; with this exception the passage may be made within the reef in smooth water. From this part the South coast assumes a more easterly direction to the low isthmus, which was probably alluded to by Quiros, the first discoverer. There are several narrow passages through the barrier reef leading to sheltered anchorages off the villages on the coast, used by coasting vessels.

Port Phaeton, the inlet on the S.W. side of the isthmus, is entered by Teputo Pass; the reefs in it are marked by beacons.

The Isthmus which connects the two peninsulas is apparently covered with trees quite across, and on both sides the land seems to be better fitted for cultivation than any other part of Tahiti. On the Tiarrabu side it is covered with fern, and scattered clumps of trees; the land level at top, but broken,

or rent as it were, into chasms or deep hollows, and rising with a gradual ascent towards the lofty mountains which form the middle and eastern divisions of Tiarrabu. At the South side of the isthmus a cove about 60 yards wide, and of sufficient depth to admit a ship, runs close up to the low neck; it would be an excellent place for a ship to moor in if a passage could be found between the large coral patches which lie without it.

TIARRABU, or Tiarrapu, is the name of the lesser Peninsula of Tahiti It is of much less importance at present than the northern portion. Captain Cook says:—"Perhaps there is scarcely a spot in the universe that affords a more luxuriant prospect than the S.E. part of Otaheite. The hills are high and steep, and in many places craggy; but they are covered to the very summits with trees and shrubs, in such a manner that the spectator can scarcely help thinking that the very rocks possess the property of producing and supporting their verdant clothing. The flat land which bounds those hills toward the sea, and the interjacent valleys also, teem with various productions that grow with the most exuberant vigour, and at once fill the mind of the beholder with the idea that no place upon earth can outdo this in the strength and beauty of vegetation. Nature has been no less liberal in distributing rivulets, which are found in every valley, and, as they approach the sea, often divide into two or three branches, fertilizing the flat lands through which they run. The habitations of the natives are scattered without order upon these flats; and many of them, appearing towards the shore, presented a delightful scene, viewed from our ships; especially as the sea within the reef which bounds the coast is perfectly still, and affords a safe navigation at all times for the inhabitants, who are often seen paddling in their canoes indolently along, in passing from place to place, or in going to fish. On viewing these charming scenes, I have often regretted my inability to transmit to those who have had no opportunity of seeing them such a description as might in some measure convey an impression similar to what must be felt by every one who has been fortunate enough to be on the spot."

All the eastern part of Tiarrabu consists of high rugged mountains, which run to the seaside, and form steep cliffs, which are extremely dangerous to pass by land; on this account the low land is narrow, and distributed partially. The coral reef fronts the whole of the eastern portion of the land, and on it, towards the South part, are some small islands.

Aguila, or *Langara Harbour*, or *Owahiouroa*, lies to the northward of one of these islands, and was so named, in 1772, by the Spanish navigator alluded to in the introductory remarks. In August, 1773, Cook's ships, the *Resolution* and *Endeavour*, narrowly escaped shipwreck here.

Ocatipea Bay is on the North side of Tiarrabu, and was visited by Cook, both in his second and third voyages. In the interval between these the Spanish commander, Don D. Bonecheo, had come hither and had died. He was buried

at the foot of a cross they had erected here, as was mentioned in the prefatory remarks.

Bougainville Harbour is on the eastern side of the larger peninsula. That navigator came here, and lost both his anchors and cables. Its entrance is through the encircling reef to the southward of an island lying within it. A second island is marked to the northward of this, and the sunken reef continues hence at a considerable distance off the shore as far as Point Venus, in some parts continuous, and in others broken up into detached patches with deep water between. It was on a portion of this that the French frigate *L'Artémise* struck in 1836.

Within 1¼ mile eastward of Venus Point are two detached patches of reef, and at 1½ mile E. by N. ½ N. of it commences the N.E. part of the foregoing reef, which thence extends, nearly parallel to the shore, for 3½ miles to the pass off the Valley of Hapaino or Papenoo, about 4½ miles distant from Point Venus, and the first valley to the eastward of it. The channel between the reef and the shore, abreast of this valley, is about a mile in width. The soundings on the reef are very regular; from the shoal part near its West end the depths gradually increase from 3 to 6 fathoms, coral rocks, but there is a patch of 4¼ fathoms on its East end. It has on its western part for a considerable distance from 3 to 4½ fathoms, and this tract may be known by its lying directly off a remarkable part of the land, which is a little declining, but nearly table land.

The outer part of this reef is from 1½ to 1¾ mile of shore. When on its centre Point Venus will just be on with the highest peak in the Island of Eimeo, bearing W. by S. ½ S. To avoid it, a ship coming from the eastward, when within 10 miles of Point Venus, ought not to bring that point to bear more westerly than W.S.W. Between the reef and shore the passage is good, but, leading to neither harbour nor place of shelter, can be of no advantage, and ought therefore to be avoided. This reef seldom, if ever, breaks, and is from one-quarter to half a mile in width, with 3 fathoms least water. From hence the reef continues in detached patches parallel with the shore, divided by several deep passes.

This reef and the following had not been laid down on any chart. They exist in the only spot off the N.E. part of the island where Capt. Cook has not laid down any, and were therefore very liable to mislead a stranger.

Fana or *Artémise Bank*, the eastern reef off Tahiti, lies off the Valley of Teallay or Tiarei, and is more dangerous than the former, from its being hidden from Point Venus. Most vessels making that part of the coast invariably stand in-shore to make that point (which is low, and covered with cocoa-nut trees), and would, by keeping too close in, in all probability, get within the reefs, as they do not break.

The outer part of Artémise Bank is from 1 to 1¼ mile of shore. The depths

vary from 2 to 4½ fathoms, in a direction parallel to the shore, the shoalest part being about 4¾ miles from Papenoo Pass. The bottom is all coral rocks, and it is from a quarter to half a mile wide. From the depth of 2 fathoms, the least water found on it, the high peak, near the centre of the peninsula of Tiarrabu, is on with the low and extreme point of the largest peninsula, bearing S.E. by S. ½ S. (this point has two small islands lying off it); and a very remarkable black mould-hill near the village, close to the beach, and nearly perpendicular, bearing S.W. by W. ½ W. A ship may enter within this reef, as there is deep water at either end, but there are several detached shoals within it, as shown on the chart.

This completes the circuit of Tahiti. The imperfection of the description of all the southern and eastern parts is of the less importance, as they are, in a commercial view, but of very slight interest.

TETUAROA, or *Tethuroa*, is a small, low island, or rather group of small low islets, about 6 miles in length, enclosed in a reef about 30 miles in circuit, and lying, according to Capt. Cook, at 24 miles N. ½ W. from Point Venus. The reef is inaccessible to large canoes. The islets abound in cocoa-nuts, which flourish most in the lowest places; in this, perhaps, they differ in their qualities from those of Tahiti. The former rulers of Tahiti would not allow the bread-fruit to be planted here, so that those who lived on it should be obliged to bring the fish which abounds around it to exchange for that article. It is plainly seen from the high ridges of Tahiti, and in former times was the watering place of Tahiti, being frequented by the licentious Areois for recovery from their bodily diseases. Its S.E. point is in lat. 17° 2′ S., long. 149° 30′ W.

Bougainville called it *Oumaitai*. Burney considers it to be the same island as the *Fugitiva* of Quiros. This opinion, which varies from that of Fleurieu and Espinosa, is also followed by Admiral Krusenstern.

MOOREA, or **EIMEO**, was discovered by Capt. Wallis, July 27th, 1767, and by him named *Duke of York Island*.

The distance between the reefs of Tahiti and that of Eimeo, as measured by the United States' Exploring Expedition ship *Vincennes*, with the patent log, was 10 miles, but the least distance, near the centre of the passage, is 7½ miles. This passage requires to be used with caution, as vessels have been becalmed for days in it while a steady breeze prevailed outside. The only winds which blow through and may be relied on are N.E. and S.W. The westerly current striking the eastern shore of Eimeo is turned to the eastward and reaches the western shore of Tahiti. Steam-vessels should sight Point Venus light before passing to the eastward at night.

Eimeo is a beautiful object in the view from Tahiti, and its beauty is enhanced on a nearer approach; its hills and mountains may, without any great stretch of imagination, be converted into battlements, spires and towers rising

one above the other; their grey sides clothed here and there with verdure, which, at a distance, resembles ivy of the richest hue.

Eimeo has, if possible, a more broken surface than Tahiti, and is more thrown up into separate peaks; its scenery is wild even in comparison with that of Tahiti, and particularly upon the shores, where the mountains rise precipitously from the water to the height of 2,500 ft. The reef which surrounds the island is similar to that of Tahiti, and has no soundings immediately outside of it. Black cellular lava abounds, and holes are found in its shattered ridges, among which is the noted one through which the god Oroo is said to have thrown his spear.

The inhabitants of Eimeo reside upon the shores, and there are several large villages on the southern side of the island; the population, by the census of 1881, amounted to 1,428. Coffee, cotton, sugar, and all other tropical plants, succeed well at Eimeo, and sugar is made to a considerable extent.

Talu Harbour lies on the North side of Eimeo; it is also called *Papetoai*, or *Teriu Bay*. It is a romantic glen, penetrating the island for 2 miles in a southerly direction, enclosed by precipitous sides, rising in some places to the height of 2,000 ft.; at its head is an extensive flat of rich alluvial soil, employed in the culture of sugar. Capt. Cook, in his third visit, was the first to find this singular and excellent harbour. "For security and goodness of its bottom it is not inferior to any harbour that I have met with at any of the islands in this ocean; and it has this advantage over most of them, that a ship can sail in and out with the reigning trade wind, so that access and recess are equally easy. There are several rivulets that fall into it The one at the head is so considerable as to admit boats to go a quarter of a mile up, where we found the water perfectly fresh."

The entrance to the harbour is between two reefs; the only danger not above water lies on the port hand going in. The land wind blows out generally strong.

Captain Powell, R.N., of H.M.S. *Topaze*, says:—"The harbour of Talu is extremely safe, and as there are no hidden dangers in the channel through the coral reef, the place is easy of access. Here the French have only a resident, but with the aid of native police the island is kept in perfect order. Europeans have commenced laying out plantations for sugar and cotton, but the labour is generally performed by natives of the Fiji or other islands, as the inhabitants of the Society Islands cannot be depended upon for any consecutive work, and as they have land where everything grows without labour, they live well enough. The population is now on the increase, and the natives are gradually selling their land.—1867.

Parau-Roa Harbour.—"On the same side of the island, and about 2 miles to the eastward, is Parau-roa or Parowroah, much larger within than that of Talu; but the entrance or opening in the reef (for the whole island is surrounded by a reef of coral rock) is considerably narrower, and lies to the

leeward of the harbour. These two defects are so striking that the Harbour of Talu must always have the preference. It is a little extraordinary that I should have been three times at Otaheite before, and have once sent a boat to Eimeo, and yet not know till now that there was a harbour in it. On the contrary, I always understood that there was not. Whereas there are not only the two above mentioned, but one or two more on the South side of the island. But these last are not so considerable as the two just described." It has been called *Papoa*, or *Cook's Harbour*, and there is a marked resemblance between it and Talu. Wood and water may be had at both harbours in abundance, but in other respects the island is not well adapted for the supply of ships. Not more than a single ship would probably be able to find refreshments at a time. It is therefore seldom visited, and its surplus produce is carried to Tahiti for sale. Notwithstanding, the articles of traffic are quite as dear as at Tahiti.

The perforated peak, before alluded to, which is 4,041 ft. high, is in lat. 17° 30′ S., long. 149° 47′ W.

TAPAMANOA, Mauiti, Maio, or *Sir Charles Saunders Island*, was discovered July 28, 1767, by Captain Wallis. Its greatest length, from East to West, is about 6 miles. In the centre a mountain with a double peak rises, but the greater part has a fertile appearance, and the lower ground abounded with cocoa-nut trees. The habitations seemed to be small, and not very numerous. The island was formerly celebrated for its yams, and in 1836 was used as a penal settlement. It is also called *Tapooa-manoo*, and *Tabuai-manu*. The hills are wooded to their summits, and at a distance the island has much the appearance of a ship under sail. The N.E. point is in lat. 17° 38′ 41″ S., long. 150° 33′ W.

HUAHEINE (*Vahine*, woman) is the easternmost of the group which was called the Society Islands by Cook, who discovered it in July, 1769. It is about 20 miles in circumference, and is divided into two peninsulas, *Huaheine-Nui*, or large, and *Huaheine-Iti*, or small. The isthmus connecting the two portions is overflowed at high water, forming a boat passage. In other parts of the island there are also salt lakes near the sea. It has a very narrow strip of fertile land near the shore; and the hills, which are not near so high as those of Tahiti, more strongly indicate volcanic action, and are in some parts entirely cultivated. The productions are similar to those of Tahiti, but come to perfection earlier. Mr. Bennett noticed the venerable shaddock tree planted by Cook in 1777. Coffee thrives in the missionaries' gardens. The population, in 1828, was estimated at 2,000.

Owharre Harbour, which was always visited by Cook on quitting Tahiti, is situate at the N.W. end of the island. Run round the North end of the island, which is clear, and you are off the entrance. Shoot up as far as you can; if the wind is scant anchor and warp in. There is another entrance more to the southward, marked by a small woody kay. The name of the

settlement is *Fari*. It was here that Cook, in his last visit, left Omai, the Tahitian native, who had attracted so much attention in England. Owharre Harbour lies, according to Cook, in lat. 16° 43′ S., long. 151° 7′ W.

RAIATEA, or ULIETEA, lies about 20 miles to the westward of Huaheine. Prior to Captain Wallis's visit in 1767, it was the principal island of the group, and in strict alliance with Otaha, the adjoining island, and also with Huaheine, but the secession of Otaha led to its decline. Mr. Bennett describes it as follows:—Raiatea is situate about 130 miles to the N.W. of Tahiti, this being the bearing in which the islands of the Polynesian groups usually lie, a direction that volcanic action appears very generally to follow. It is about 40 miles in circumference; of a mountainous character, covered with vegetation, and but too well watered, cascades, rivers, and swamps, abounding in all directions. At the distance of 1½ or 2 miles from the shore the land is encircled by a coral reef, that also includes the adjacent Island of Taha. Here are seven excellent anchorages on the weather and lee sides of the island, accessible at times, and egress easy, except with a due South wind. Raiatea had no commerce worthy of notice; cocoa-nut oil and arrow-root are occasionally procured by small vessels from New South Wales or South America; attempts have been made to produce tobacco, and to make ships' cordage from the bark of the hibiscus, for the Sydney market, and collect biche-de-mer, with which the reefs abound, for that of China.

The island is beyond the limits of the French possessions, and the in habitants are constantly in a state of war, either among themselves, or with the natives of the neighbouring islands. The zeal and devotion of the two missionaries, Messrs. Vivian and Green, have done much towards civilizing these people, and their influence is very great.

"The soil is exceedingly fertile, exotic fruit trees thrive vigorously; and particularly the fruit of the lime proves invaluable to foreign shipping, and affords a striking example of the important advantages that accrue from the dissemination of useful fruits and vegetables. The population appeared to me to have suffered dreadfully from disease."—*Bennett.*

The surrounding coral reef has several islets on it, and the space between it and the island offers several excellent anchorages, as before stated.

Uturoa Harbour is one of the best of them, and is on the East side. It is a reef harbour, and has two or three entrances; H.M.S. *Conway* went in at the most northerly. From Huaheine steer across for a bluff that forms the northern extreme of Raiatea, and you will see two islets, between which is the passage. If bound to leeward, it is usual to run out through a passage to leeward of the island, keeping round inside the reefs; to do this you must be able to lay up South on the port tack. The King's Wharf in Uturoa is in lat. 16° 50′ S., long. 151° 24′ W. Captain Worth, R.N., says the best anchorage amongst the islands is at Raiatea, as there is a good entrance, and equally as good an exit, and which are always capable of being taken, the wind always

blowing directly through. The only disadvantage is the depth of water, about 18 to 24 fathoms. The holding ground is, however, very good, with abundance of fresh meat, vegetables, and fish, to be obtained. Fresh water can also be procured here, but not so readily as at Tahiti.

Ohamaneno Harbour is on the N.W. side of Raiatea. The entrance is between two sand islands, and is about a quarter of a mile broad. The numerous astronomic observations made by Capts. Cook and King in 1777, place this bay in lat. 16° 45′ 32″, long. 151° 36′ 22″ W.

TAHAA, or Otaha, lies to the northward of Raiatea, but is separated only by a channel of not more than 2 miles in width. They are both surrounded by the same reef; and the space between them enclosed by the reef forms a beautiful sound, which merits examination. Tahaa is about half the size of Raiatea, and is not so fertile. Capt. Cook visited it in 1769 in his boats, and Lieut. Pickersgill was sent around it by him in a boat in 1773. It is surrounded on all sides by a number of small islands, and all the passages between them are encumbered with coral reefs. But there are several commodious harbours within, as *Ohamene Harbour*, on the S.E. side, and *Oherurua Harbour*, on the western side. The proximity of those on Raiatea, however, render them unimportant. The centre of Tahaa is in lat. 16° 35′ S., long. 151° 35′ W.

BOLA-BOLA, or Bora-Bora, is about 8 miles N.W. of Tahaa, to which it is inferior in extent, but the reef with which it is surrounded is nearly full of islets, much larger than those which are scattered among the rocks that enclose Raiatea and Tahaa. It differs from those islands, and from Huaheine, in having but one harbour on its coast; whereas the shores of the others, being strongly indented, form, like the coasts of Eimeo, numerous places of shelter for shipping. It is also distinguished by a very lofty double-peaked mountain in its centre, and is more rude and craggy than the rest of the Society Islands. Its eastern side has a barren appearance; the western is more fertile; a low border which surrounds the whole, together with the islands on the reef, are productive and populous. Its earliest inhabitants are said to have been malefactors, banished from the neighbouring islands. Capt. Cook did not land here upon his first or second voyage, and in 1777 he was prevented from anchoring in the harbour, which is very spacious, by contrary winds. On its West side is *Vaitape*, the port.

Otea-vanua Harbour is on the West side; it is well sheltered, and, as before stated, very spacious; the depth is 25 fathoms, on good holding ground; but the entrance has the disadvantage of a rocky bottom. Capt. Worth, of H.M.S. *Calypso*, says:—"The anchorage at Bora-Bora is difficult, as you are obliged to shorten sail between the points forming the entrance, and shoot up as far as the ship's way will allow, and then anchor, the wind always blowing directly out; it is then necessary to kedge up to the head of the harbour, where you may generally be able to make sail to the anchorage off the settlement.

"Here, as in all the harbours of the Society Islands, it is advisable to enter before noon, as the water appears to be still, and at times setting in until noon, when it recedes, the strength of the current being determined by the body of water thrown inside the reefs, and which depends upon the strength of the wind, and the break over the reefs caused by it.

"The reefs which surround these islands are all steep, and do not extend further than 1½ mile except at Bora-Bora, where the reef stretches to the S.E., nearly 3½ miles, making a very dangerous spit, particularly coming from Raiatea, as it is in the route to the harbour of Bora-Bora."

The settlement at Otea-vanua is in lat. 16° 31′ 35″ S., long. 151° 46′ 0″ W.

MARUA, or MAUPITI, or, according to Capt. Bethune, *Manite*, is the westernmost of the group. It is a small and comparatively elevated island, about 6 miles in circumference, and its highest point nearly 800 ft. above the sea. It is 40 miles to the N.W. of Raiatea, and is distinctly visible from the lower hills of that island. It is surrounded by a coral barrier reef at the distance of about 3 miles, enclosing numerous small islets covered with cocoa-nut trees, but the lagoon is too shallow to admit vessels exceeding 150 tons burden.

The island is composed of hills wooded to their summits, and occasionally crested by cocoa-nut trees, but presenting ragged and mural cliffs to the sea coast, especially one rocky mass on the S.W. side, *opposite the opening* in the reef, which rises 700 ft. above the sea, resembling the ruins of a gigantic castle. Volcanic rocks, scoriæ, and slag abound; its smooth basaltic stones are much prized by the natives of all the Society group, to make pestles to prepare their food. The population of the island appeared small (about 1,000 in 1828); habitations were scattered along the coast, but the principal settlement is on the S.E. or weather side, where there is also the residence of the chief Tairo. It contains a Christian church. Swine, fowl, and especially yams, are abundant; water is scarce. The natives were exorbitant in their charge for supplies, and rather disposed to theft. This island is little frequented by foreign vessels; no ship before the *Tuscan*, in 1835, had visited it for two years. The centre of the island is in lat. 16° 26′ S., long. 152° 12′ W.

TUBAI, or Motu-Iti, is the northernmost of this group, and consists of some very small, low islets, connected by a reef, about 10 miles N.N.W. of Bora-Bora, to which it was subservient, in the same manner as Teturoa, which it resembles, was to Tahiti. Perhaps it has no permanent inhabitants; but it is stated that, during the early visits of our navigators, it abounded with turtle, for which it was resorted to by the natives of the Society Islands, and also probably by some from the Low Archipelago. The North point of the reef is in lat. 16° 11′ S., long. 151° 48′ W.

One other island is stated to have been found by Quiros, that is, *Peregrino;* but M. de Fleurieu says it is most probably the same as the Scilly Islands of Wallis, described in the next Chapter.

CHAPTER XIII.

ISLANDS BETWEEN LATITUDES 10° AND 20° SOUTH.

In this chapter we shall include those scattered islands and more connected groups which lie between the Society Islands and the Fiji Islands, which form the subject of the next Chapter. The Cook Islands and the Tonga Islands, which lie on the parallel of 20° South, have been before described.

FLINT ISLAND was discovered in 1801. By some it is considered to be the Peregrino of Quiros; but from Torres and Torquemada's description of Peregrino being 8 or 10 Spanish leagues from North to South, this is unlikely. It was examined, and its position fixed by the United States' Exploring Expedition. Flint Island, situated in lat. 11° 25′ 43″ S., long. 151° 48′ W., is about 13 ft. high, 3 miles in length N.N.W. and S.S.E., by half a mile broad, and thickly wooded; high breakers extend off its North point for some distance, and the surf was so high, that it was deemed impossible to land with a boat. No inhabitants were seen. The current was found to be setting to the westward.

It is fringed by a steep coral reef which dries at low water, and extends seaward half a cable; off the North end of the island the reef extends seaward nearly half a mile, and off the South end E.S.E. a quarter of a mile. In the interior of the island are two lagoons having brackish water.—*Annalen der Hydrographie*, 1878.

The European settlement is situated near the landing-place on the West side of the island. A mooring buoy is placed in 95 fathoms off the landing-place; its anchor is secured by a chain to an inner buoy situated close to the shore; the inner buoy is secured by chains to the shore. Vessels are recommended during easterly winds to make fast a hawser also to the inner buoy. *Guano* is shipped at the island. There is little or no rise and fall of tide.

VOSTOCK, or *Wostock Island*, was discovered by Capt. Bellingshausen in 1820. It is in lat. 10° 5′ S., long. 152° 23′ W. There is no doubt but that it is the same island seen by the American Capt. Stavers in 1821 and 1825, and also *Anne Island*, both of which are placed among the doubtful islands by Krusenstern. It is called *Stavers Island*, also, by Capt. Wilkes, who places it

in exactly the same position as Bellingshausen. It is a low, sandy islet, with a lagoon. It is well wooded, half a mile in diameter, of an oval shape, with heavy breakers surrounding it, which prevented the possibility of landing on it.

MOPELIA ISLAND (*Mopihá*) was named by its discoverer, Capt. Wallis, *Lord Howe Island*, July 30, 1767; but as this name is repeated in several parts of the Pacific, the native name, as above, is to be preferred; this was given to it by Cook. According to Wallis, it is 10 miles long and 4 miles broad. Cook's position of it is lat. 16° 46′ S., long. 154° 8′ W., differing only 5′ from the longitude of Wallis. According to Commander Hamond, of H.M.S. *Salamander*, it is in lat. 16° 50′ S., long. 154° 21′ W.; Capt. Scheibner, German barque *Unkel Breasig*, 1875, reported its approximate position to be lat. 16° 52′ S., long. 154° W.

BELLINGSHAUSEN ISLAND was discovered by Captain Kotzebue in 1824. He gives its position as lat. 15° 48′ S., long. 154° 30′ W. It is a low, coral island, uninhabited, of a triangular form, and richly covered with the usual vegetation, with the exception of cocoa-nut palms. Birds are very abundant and very tame. There is no opening into the lagoon, but the tide flows into it over the reef.

SCILLY ISLANDS were discovered by Capt. Wallis in 1767. They form a group of small islands, which, being very low, are exceedingly dangerous. He places them in lat. 16° 28′ S., long. 155° 30′ W.; but corrections from various sources place them in long. 154° 50′ W. Capt. Scheibner places them in lat. 16° 31′ S., and long. 154° 43′ W.; but Lieut. Palmer, H.M.S. *Myrmidon*, 1876, gives the approximate position of the easternmost Scilly Island as lat. 16° 28′ S., long. 154° 30′ W.

Between Mopiha and Scilly Islands the *Unkel Breasig* experienced a current of 11 miles in 24 hours to windward, the wind at the time being N.N.E. force 7 to 8.

Some islands have been placed on the charts in this neighbourhood, stated to have been discovered by Roggewein in 1722. His journal is given in Burney's Chronological History, vol. iv., p. 569, *et seq.* These are *Bauman Islands*, *Roggewein Islands*, *Tienhoven Island*, *and Groeningen Island.* The situation, or supposed situations, of all these were carefully sought over by Capt. Kotzebue, and also by the United States' Exploring Expedition, but without any success. As it is very evident that the assigned positions may vary several degrees from the truth, it is more than probable that they are identical with some known islands.

GRAND DUKE ALEXANDER, or Reirson Island, was discovered by Capt. Bellingshausen in 1820; and again, in 1822, by Captain Patrickson, who calls it by the latter name.

It was visited by H.M.S. *Hecate* in 1863. According to the report then

made, *Reirson Island* (*Rokahanga*) lies about 20 miles to the N.N.W. of Humphrey Island, and is similar to it except that it is about half the size; it has also its village, church, and school on the south-western side, with native teachers, and nothing can exceed the order and correct behaviour of the natives, who numbered about 340.

Landing is not very good here, but can generally be effected in a whale boat, with the assistance of the natives, who wade out into the surf and guide the boat through the narrow and winding fissure in the reef, about one-third of a mile to the northward of the village.

The missionary vessel of the London Mission pays periodical visits to these two, as well as to many of the islands, where they have teachers established. The position of the church is lat. 10° 2′ S., long. 161° 5′ 30″ W.

Capt. Powles, of the ship *John O'Gaunt*, 1882, states that Reirson Island bears *due North* of Humphrey Island.

HUMPHREY ISLAND was discovered October 13, 1822, by Captain Patrickson, in the *Good Hope*; it was not seen, as the other island was, by Bellingshausen. It was seen by Freycinet.

It was visited by H.M.S. *Hecate* in 1863, and is thus described:—Humphrey Island (*Monahiki*) is a coral lagoon island of triangular shape, with its apex to the North; it is 6 miles in length by 5 miles at its greatest width, low, and densely covered with cocoa-nut trees, which reach to a height of from 60 to 70 ft., and render the island visible at 12 miles from a vessel's deck.

The population amounted to between 400 and 500; their food consists of the fruit of the cocoa-nut tree and fish caught in the lagoon. The former are very productive, and great pains are taken to renew them by replanting. Each family has a certain number of trees allotted to them, and even the lagoon is partitioned out in the same way for fishing. They are an extremely well-conducted people, and have two native teachers among them, sent from the English mission at Raratonga. Many of the natives speak and write the English language.

The village is on the West side of the island, and is very clean, neat, and well built, and paved with coral; there is also a large church and school-house. The island is governed by a chief, who styles himself king, and holds some sway over the neighbouring Island of Reirson. There is no entrance into the lagoon, even for boats, but there is fair landing with a whale boat on the N.W. side of the island, close to the village, except during the months January to April, when westerly winds and unsettled weather prevail. There is no safe anchorage at any time.

The North point of the island is in lat. 10° 20′ 30″ S., long. 161° 1′ 12″ W.

Souworoff or Suwarrow Isles were discovered Sept. 27, 1814, by Lieut. Lazareff, commanding the *Souworoff*, a vessel belonging to the Russian American Company. The approach was indicated by large flocks of birds.

They landed, and found them inhabited only by birds, crabs, and rats, with here and there a few shrubs, but no sign of people.

The group is composed of three low wooded islands connected by a reef, on which are a number of hummocks and rocks. Including its encircling reef, which encloses a lagoon having smooth water, it is 12 miles long North and South and 9 miles broad; the East extreme of the reef is marked by several hillocks about 15 ft. high. The eastern island has cocoa-nut trees, and is the most conspicuous of the group; position, lat. 13° 14′ 30″ S., long. 163° 4′ 10″ W. —*U.S. Hydrographic Notice*, 1878.

A wharf has been built upon the island by Messrs. Henderson and Macfarlane, of Auckland, who further report, that there is an entrance through the barrier reef which surrounds the island, on the N.E. side, and safe anchorage inside the lagoon (1876). A *light* was also shown from a wooden pyramid on a stone base, but is now discontinued.

DANGER ISLES were discovered by Commodore Byron, and are stated by him to be three in number, surrounded by rocks and breakers, and having a dangerous reef 9 leagues E.S.E. from them, probably Tema Reef. His position is in lat. 10° 15′ S., long. 169° 28′ W.; which Krusenstern corrects to 165° 58′. A similar group of three islands was discovered by Bellingshausen in lat. 10° 54′ S., long. 165° 54′ W., but he did not see the reef to the eastward. They were visited by Commander Miller, U.S.S. *Tuscarora*, in 1876. whose observations are incorporated in the following description.

This group, consisting of three islands and surrounding reefs, are comprised within the limits of lat. 10° 48′ 30″ and 10° 56′ S., and extend East and West for a distance of 10 miles. These islands are flat-topped, about 20 ft. high, and well wooded, principally with cocoa-nut trees, and are connected by a continuous reef, enclosing a lagoon without any entrance to it, on the western part of which the barque *John Williams* was wrecked in May, 1864, by a drift setting to the westward at the rate of 4 miles an hour.

Puka-Puka, the northernmost island, and the only one inhabited, is about 2 miles long N.W. and S.E.; it contains 377 inhabitants, two of whom are Europeans. *Motukoe*, or *Koko*, the S.E. island, is about 2½ miles S.S.E. of Puka-Puka; about 1 mile N.W. of Motukoe, and 2 miles S.S.W. from Puka-Puka, is *Motukavata*, or *Ratoe*, the S.W. island, long and low, rising in a lump near its southern end. The position of the N.W. part of Puka-puka—by observations taken on shore—was found to be in lat. 10° 49′ 6″ S., long. 165° 51′ W. Observations taken from H.M.S. *Alert*, 1880, placed its N.E. point in lat. 10° 53′ S., long. 165° 45½′ W.

A reef extends to the North and westward of Motukavata for a distance of 5 miles, having upon it a sandbank 2 or 3 ft. above water, at a distance of about 1¾ mile from the island. This reef is extremely dangerous, on account of its extent, and the strong current that sets on to it. The reef extends to the southward of Motukoe and to the northward and eastward of Puka-puka, for

about a mile. The only landing place (and that an impossible one for ships' boats), is on the North side of Puka-puka.

No hurricanes have ever been known to occur here. The products are taro and cocoa-nuts. Fresh water might be obtained from Puka-puka, for small vessels, by using native canoes. The position of a rock nearly central as regards the three islands, was ascertained to be in lat. 10° 52′ 45″ S., long. 165° 51′ 30″ W.—*Commander J. N. Miller, U.S.S. Tuscarora.*

Tema Reef.—At Puka-puka, in 1863, Captain Williams heard of a reef, which the natives described as lying in a S.E. direction from the Danger Isles. On May 15th, 1864, the day previous to the wreck of the barque, Captain Williams sought for and found a reef supposed to be the one alluded to by the natives. From an examination made by H.M.S. *Alert*, it was found to be about a quarter of a mile in diameter, steep-to, and breaks heavily, but with no rocks showing above water. It is in lat. 11° 5′ 30″ S., long. 165° 37′ W.

The position of a reef reported in lat. 10° 45′ S., long. 166° 25′ W., or about 37 miles to the westward of the Danger Islands, was passed without being seen by the *Alert*, 1880.

Nassau Island was discovered in March, 1835, by an American whaler of that name, Capt. Sampson. It may be identical with Ranger Island.

The following remarks are from the report of Mr. William Williams, master of the English barque *John Williams;*—On April 18th, 1863, at 2 p.m., landed with difficulty on the North side of Nassau Island, which is about 50 feet high, and apparently without water. From the mast-head the island appeared to be in the shape of an equilateral triangle, each side being about 1½ mile in length. No outlying dangers, beyond the fringe reef, were seen.

The North part of the island was found to be in lat. 11° 31′ 50″ S., long. 165° 23′ 56″ E. It was then uninhabited; some cocoa-nuts were planted.

The best landing place is on the North side of the N.W. point; but even with a smooth sea, a boat from the *Alert* was unable to effect a landing, the swell being so great. There is no safe anchorage. The island is covered with screw-pines and young cocoa-nut trees; the people living on the island being dependent upon the visits of a trading schooner for their provisions. The inhabitants consisted of one white man and two natives from Danger Islands, with their wives; they were left by an American merchant, about the year 1877, with a view to planting cocoa-nut trees, those planted being expected to produce fruit in 1882.

Swain's Island, or Gente Hermosa (*Handsome People Island*), was discovered by Quiros in 1606. Mendaña also, in 1595, discovered the islands of San Bernardo. The last are described as four low islands, 12 leagues in circumference, surrounded on all sides by rocks and breakers. Of course, in these older observations there are very great discrepancies. In lat. 11° 5′ S., long. 170° 55′ 15″ W., the United States' Expedition discovered a coral island, January, 1840, to which the name of Swain's Island was given, no doubt the

same as Gente Hermosa Island of Quiros. It is of coral formation, but has no lagoon; it is nearly round, and about 4⅓ miles in circumference; it may be classed with the high coral islands, and is elevated from 15 to 25 ft. above the level of the sea. The sea breaks constantly on all parts, and no safe landing exists. With the exception of some groves of cocoa-nut trees, there were no signs of its ever having been inhabited. Pigeons were observed on it.

SAMOA, OR NAVIGATORS ISLANDS.

The Samoa, or Navigators Islands, lie between the parallels of 13½° and 14½° S., and the meridians of 168° and 173° W., and consist of four principal islands and five smaller, reckoning Rose Island to the eastward among the number. Krusenstern considers them to be the same as the Bauman Islands, discovered by Roggewein in 1721. However, there are many doubts as to this, and it is not of much importance. They were first seen, as now known, by Bougainville, in 1768, and by La Pérouse, in 1787; the former named them the Isles des Navigateurs, from the skill with which the natives managed their canoes. Since that period they have been visited and described by Captain Freycinet; Capt. Edwards, in the *Pandora;* Kotzebue, in the *Predpriatie;* and more completely by the United States' Exploring Expedition, in 1839. To this latter source, and to the remarks of Capt. Bethune, R.N., we are indebted for the principal portion of the subsequent descriptions. Of late years several of the ports have been surveyed by officers of the Imperial German Navy.*

The whole of the group (excepting Rose Island) are of volcanic origin, and have remains of extinct craters, which are peculiarly visible at Apolima, East of Savaii, and the lake Lauto, on the ridge of Upolu, which is 2,570 ft. above the sea. They are generally surrounded by coral reefs, which, in many instances, are much modified. The few harbours are generally situated within the reefs, but there are but two of primary importance in the group. That of Pago-Pago, on the South side of Tutuila, is a deep, land-locked basin, of easy approach, and perfectly secure anchorage. This is the best port for the refitting of vessels, or for any purpose requiring more than a passing visit. Apia, on the North side of Upolu, in lat. 13° 49′ 44″ S., and long. 171° 44′ W., is more convenient for temporary purposes or refreshment, as it is nearer to the fertile districts, and is also the place where the consuls and the principal missionaries reside. To Apia the remains of the unfortunate and respected Mr. Williams, and also those of Mr. Harris, were brought by H.M. sloop *Favorite*, in 1839, from Erromanga.

* For a general description of these islands, see a paper by Litton Forbes, Esq., M.D., in the "Proceedings of the Royal Geographical Society," No. ii. of vol. xxi., 1877, pp. 140–148.

Between the years 1868 and 1873, and again in 1879-80, these islands were devastated by a civil war, but in 1882 the country appeared to be much more settled, under the rule of King Malietoa Laupepa.

There are several cotton plantations in the islands belonging to foreign residents, but there is great difficulty in finding labourers, the natives being disinclined for work. Coprah and cocoa-nut oil are prepared; arrowroot is exported; coffee and sugar are being tried, but the difficulty of purchasing land from the natives prevents their cultivation for export, although the climate is very suitable.

Treaties were concluded in 1878 and 1879 by King Malietoa Talavoou, with the United States, Germany, and Great Britain, whereby the latter is permitted to establish coal depôts, &c., on the islands, the port of Pago-Pago is placed at the disposal of the United States, and that of Salouafata at the disposal of Germany, for naval stations.

The French endeavour to rival the English and Americans in the infant commerce now rising here. They have two missions on Savaii, and two on Upolu; these, with the other Roman Catholic missions on Mangaia, Rarotonga, and Rotumah, formed part of the diocese of M. Bataillon.

To vessels requiring refreshments these islands offer abundant supplies of wood, water, and provisions of the usual kinds. The islands seem fit for every tropical production, and there is a great quantity of rich level land in all. There are a few cattle on the islands; beef, yams, and pumpkins may be reckoned on at moderate rates. Poultry of all descriptions is plentiful, and pigeons abound, but are considered sacred. Fish may be taken abundantly, and in great variety.

The Samoans have been somewhat misrepresented, as being ferocious and treacherous. Though this may not be entirely without foundation, yet they possess many good qualities, and are very desirous of pleasing and exercising hospitality. The beneficial effects of the missionaries are more evident here than at Tahiti. The white visitor will therefore find his way in a great measure prepared for him, and it is sincerely to be hoped that he will not abuse the privilege. Later visitors speak very highly of their general honesty, cleanliness, refinement, and virtue.

The islands collectively contain an area, according to the American estimate, in 1840, of 2,650 square miles, and a population of 56,600, of whom 14,850 had embraced Christianity, and 12,300 attended the schools; besides this, two-thirds of the population belong to the Christian party. In 1849, however, Admiral Erskine gave the missionary estimate as 37,000, a number then considered to be diminishing gradually, though slowly. In 1882, the native population was estimated at about 31,300, besides 1800 imported Polynesians and 300 Europeans.

Winds.—In summer, November to April (the rainy season), variable light East winds with frequent calms are experienced at Samoa. Hurricanes occur

especially from January to the middle of April, commencing with a violent N.E. wind, passing through North and West to S.W. From April to November the S.E. trade wind is rarely interrupted by calms or S.W. winds, except near the land, where land and sea breezes occur.*

The *Climate* of the islands may be termed variable; and there is much bad weather, particularly during the summer months, when long and heavy rains, attended at times with high winds and northerly gales, are frequent. The mean temperature of the winter and summer months is 78° and 83° respectively. Destructive hurricanes also occur, sometimes blowing down the trees and destroying the houses. Although these severe hurricanes do not happen very frequently at the Samoa Islands, yet it is probable that they occur very frequently between them and the Friendly Islands, where scarcely a season passes without some of the islands suffering from one of these awful catastrophes.

The group, like all in nearly the same parallel of latitude, is subject to violent hurricanes, between the months of November and May, during which period the usual trade winds are frequently suspended for several days at a time. They seem to be rotary storms of small diameter, passing from West to East, and sometimes to S.W.—*Admiral Erskine.*

It would therefore be advisable for whaling ships to avoid cruising in the neighbourhood of these groups during the season of the year that these storms are liable to occur, viz., from the middle of December to the end of April. Some ships have been almost made complete wrecks of, that were so unfortunate as to be overtaken by them.

Earthquakes are not unfrequent, but they do little or no damage, as the buildings and houses are elastic.

The *flood tide* among the islands sets to the westward; beyond its influence, on the southern side of the islands, a current generally prevails to the eastward; while it runs westward on the northern side. Vessels, therefore, when beating to windward, would find it to their advantage to keep on the southern side of the group, where there is not only a favourable current, but the winds would be found more regular, and calms less frequent.

ROSE ISLAND, the easternmost island of the Samoan group, was discovered by Freycinet, and so named after his wife, who accompanied him. Afterwards (in 1824) it was seen by Kotzebue, who gave the name of his first lieutenant, *Kordiukoff*, to it, being unaware of Freycinet's discovery. He describes it as exceedingly dangerous, from its low elevation; but Wilkes (October, 1839) says, that at first it resembles a round knoll of land, but which is in reality a

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* For further particulars of the weather at Samoa see a paper by Dr. E. Graffe, in the "Journal des Museum Godeffroy," 1873, Heft ii., Hamburg; and also a paper by R. H. Scott, Esq., M.A., in the "Quarterly Journal of the Meteorological Society," London, vol. v., 1879, pp. 178–189.

clump of trees. It is S. 77° 50′ E. *true*, 78 miles from Manua. It is a low, small, annular coral island, inundated at high water, with the exception of two small banks, one of which is covered with trees. There is a shallow entrance into its lagoon on the N.W. side. The tide rises 4½ ft., the flood setting eastward. In stormy weather the sea must make a complete breach over the reef.

Sir Edward Belcher says:—*Rose* or *Middleton Island* does not exceed 30 feet in height, and is of a very soft spongy soil, on a slaty micaceous shale, intersected by quartz dykes. A few fuci, land shells adhering to ferns, and three small alca, comprised our collection. The ripples I had observed were found to arise from ledges of rock, on which as little as 2 fathoms was found. The tide was ascertained to set—flood, N.E.; ebb, S.W. Some fine halibut were hooked.

Capt. Mignon, of the French ship *Jupiter*, says that the sand-banks extend more than 2 miles to the W.S.W., and that it looks very dangerous to approach too near. It is in lat. 14° 32′ S., long. 168° 9′ W.

The eastern group is properly called the Manua Group, and consists of Manua-tele (Great Manua) or Tau, Ofu, and Olosinga. The population of the group in 1849 was rather more than 1,300; only 3 or 4 whites. They were all nominally Christians.

MANUA (*Manua-tele* or *Tau*) is the easternmost of the principal range of islands, and was called *Opoun* by La Pérouse. It has the form of a regular dome, rising precipitously from the water to the height of 300 or 400 ft., and then more gently to 2,500 ft. It is 16 miles in circumference, is covered with a luxuriant vegetation, and has many cocoa-nut groves on its N.W. side. Its area is about 100 square miles. The principal settlement called *Tau* is on the N.W. side, and there is anchorage for a vessel near the shore, with a cove to land in. In the line between the two heads the depth is 34 fathoms. Landing is not very easy for boats, as they have to thread their way through the coral patches. The tide rises about 6 ft.

While the trade wind is blowing vessels may anchor off the village of *Feleasau*, in a small bay just East of the N.W. point of the island. H.M.S. *Brisk* anchored here in 15 fathoms and found it tolerably sheltered, but a vessel should be prepared to weigh on any change of wind. The landing place is a very narrow passage through the reef, only wide enough for a whale boat, and is dangerous if there is much swell on.

The natives are very willing to trade, "bacca" and fish-hooks being in great request by them. These islands furnish pigs, fowls, sweet potatoes, fruit, and some taro. Many running streams were seen coursing down the sides of the island.*

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* On September 12, 1866, dense masses of smoke arose out of the sea, about 2 miles E.S.E. of Olosinga, and continued in active operation till the middle of November,

OLOSINGA, OROSENGA, or Orisega, which is the *Leoné* of La Pérouse, is a narrow ledge of rocks, rising nearly perpendicular on both sides; it is 3 miles in length, and 1,500 ft. high. It is the residence of the chief of the islands, in consequence of its being easily defended; he lives on the N.W. side. The coral reef around it differs from most others, and has been apparently upheaved 15 or 20 ft., for it consists of two regular shelves, one beyond the other. H.M.S. *Brisk* could find no anchorage on the North side. The landing place is difficult at low water, on account of the fringing reef.

Ofu lies to the westward of Orosenga, and is the *Fanfoué* of La Pérouse, There is a passage for boats of a quarter of a mile wide between them, and anchorage on the western side. Ofu resembles Orosenga, and has but few inhabitants. There is a small and comparatively low islet off its western end, near which is an anchorage.

TUTUILA is the *Maouna* of Bougainville, and has acquired an undesirable, and it is now believed an undeserved, reputation from the massacre of the Comte de Langle, M. de Lamanon, the naturalist, and the rest of a boat's crew belonging to La Pérouse's expedition. This occurred from one of the natives having been shot on board the *Astrolabe*, when the indignant natives retaliated in this way on the watering party. Subsequent experience has proved that the bad character given to these people in consequence does not really belong to them. It is now believed that the massacre was perpetrated by some chiefs and their followers, who were here on an annual visit from Upolu.

The island of Tutuila, or, as it is called by Capt. Edwards, of the *Pandora*, *Tootooellah*, and *Tutyella*, is high, broken, and of volcanic appearance. It is 17 miles long, and its greatest width is 5 miles. The harbour of Pago-Pago (Pango-Pango) penetrates into the centre from the South, and almost divides the island into two parts. It is less varied than the Society Islands, and its highest peak, that of *Matafoa*, is 2,327 ft. above the sea. The spurs and ridges that form the high land are precipitous, sharp-edged, and frequently rise in mural walls from the water to the height of 300 or 400 ft., showing the bare basaltic rock. Above this height the surface is covered with a luxuriant vegetation to the very top of the mountains. The cocoa-nut tree and the fern give the principal character to the beautiful scenery.

Tutuila is thickly settled round its shores, and particularly at its south-western end. The population was estimated, in 1849, by the missionary, at 3,600 to 3,700, but was declining from the mortality caused by the whooping cough.—(*Erskine.*) This end is lower and more easily cultivated than the

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throwing out thick dark smoke higher than Olosinga. The outbreak was preceded by repeated earthquake shocks. Large quantities of fish were killed, and the sea was discoloured for miles around. No information has been received whether there is a shoal. It was previously deep water.

eastern, which is high and rugged. The only communication is by the seashore, the hills being too precipitous and difficult of ascent to pass over.

It has many desirable ports or bays on its North side, where vessels may obtain wood, water, and supplies. The best and safest port, however, is Pago-Pago, on its South side, which affords a safe harbour for vessels to overhaul, and where supplies may be obtained.

PAGO-PAGO HARBOUR may some day become important as a coaling station for steamers between San Francisco and New Zealand and Australia.

Pago-Pago Harbour (or Pango-Pango) is one of the most singular in all the Polynesian Isles. It is the last point at which one would look for a place of shelter; the coast near it is peculiarly rugged, and has no appearance of indentations, and the entrance being narrow, is not easily observed. Its shape has been compared to a variety of articles; that which it most nearly resembles is a retort. It is surrounded on all sides by inaccessible mural precipices from 800 to 1,000 ft. high. The lower parts of these rocks are bare, but they are clothed above with luxuriant vegetation. There are two breaks in the precipice, one at the head of the harbour, and at *Pilot's Cove*. The harbour is easy of access, and its entrance, which is about two-thirds of a mile in width, is well marked by *Tower Rock* and *Devil's Point*. Capt. Bethune, R.N., says,—"It may distinguished by lying betwixt two hills—that on the West conical; that on the East square or elliptical."

The shore reefs extend from 100 to 200 yards from the beach; they are perpendicular or shelving on their outer edge, and are awash at low water. The surf breaks over them at all times, distinctly marking their outline.

Taema Bank, lying off the entrance of Pago-Pago, was found to be 3 miles long East and West, and from one-half to a mile wide; the western extremity bearing S. by E. from Breaker Point, distant about 1½ mile. The least water (4½ fathoms) over which the sea breaks in bad weather was found on this end of the bank, and is the only danger to be avoided outside the shore reefs.

Nafanua Bank commences about 1½ mile N.E. by N. of the eastern end of Taema Bank, and extends E. by N. ½ N. about 3 miles to the S.W. end of Anuu Island. It is from a quarter to half a mile wide, and has from 5½ to 26 fathoms water, the soundings being irregular.

In making the harbour from the northward under steam, vessels should use the channel between Anuu Island and the Nafanua and Taema Banks, and Tutuila, it being half a mile wide and clear of danger. Breaker Point, bearing W. by N. ½ N., leads through the channel, between Taema and Nafanua Banks. Taema Bank should be avoided, even in fine weather, by vessels drawing over 12 ft. There are no known dangers on Nafanua Bank.

Whale and Grampus Rocks, both of coral formation, are the only hidden dangers in the bay. *Whale Rock* is about 100 ft. in diameter, and has 8 ft. on it at low tide, with 18 to 25 fathoms around it. A black cask buoy has been

placed 60 ft. East of the rock in 23 fathoms water. The sea breaks over the rock in bad weather, otherwise it is not easily seen. There is a clear passage, about 1 cable in width, between the rock and Blunt Point, with from 25 to 30 fathoms water. *Grampus Rock* bears N.E. by N., about 3 cables distant from Whale Rock, It is about 60 ft. in diameter, and has 8 ft. on it at low tide. There is a narrow passage between it and the shore reef, but it should not be taken except in cases of emergency; there is from 23 to 25 fathoms of water in the channel. A red cask buoy has been placed 60 ft. to the southward of the rock, in 25 fathoms water.

There is a sunken rock N.W. by N. ¼ N., about 4½ cables from Grampus Rock, but it is well marked by the surf which breaks on it continually.

H.M.S. *Danae*, 1880, twice used the passage between Taema Bank and the reef off Deceit Point, to the eastward. Peiva Peak, 1,470 ft., in line with, and seen over Breaker Point N. by E. ¼ E. leads through in mid-channel. There were no buoys marking the Whale or Grampus Rocks at the time of the *Danae's* visit.

The Pilot for Pago-Pago lives on the island of Anuu, and if the usual signal is made will put off from the N.W. point of the island, and board the vessel in the channel, or abreast the island outside. His name is John Adams, a native of the Sandwich Islands. He has been here about ten years, and speaks English sufficiently well to make himself understood (1876). The charge for pilotage for men-of-war and merchant vessels is one dollar per foot of draught, and one dollar per day for detention on board. Where pilots are declined, half-pilotage is to be paid. The pilot is furnished with a copy of the port regulations to show to the master of each vessel which he may bring into port.

Supplies.—Wood and water can be had, the latter at Pago-Pago, Fonga-Tongo, and Fangaalu. The latter is the best watering place, but it is a great distance from the usual anchorage in the inner harbour. If casks are used, they can be filled in either place, at any stage of the tide. Boats, however, cannot approach the watering places except at high water. Fruits, such as bananas, oranges, pine-apples, cocoa-nuts, and plantains, are plentiful, and can be procured from the natives by barter. Yams, taro, and bread-fruit can be procured in small quantities. The natives have a few fowls and pigs for their own use, but not for sale, at least we were unable to procure any from them. There are a few cattle owned by the missionaries, from whom a bullock can be procured occasionally, but this cannot be depended upon as a source of supply.

Directions.—Having entered the channel midway between Anuu and Red Point, steer about S.W. by W. ½ W., until abreast of Round Bluff; then W. by S., heading for the peak of Matafao, keeping Tower Rock a little open on the starboard bow until up with Breaker Point; then haul in, giving the point a berth of about 1 cable when bearing E.N.E., then steer N.W. by

N. ½ N. 2½ cables until Blunt Point bears West, when the northern side of Whale Rock will be in line with that point, distant from the ship about 1½ cable; then steer N.W. ¼ N., keeping the native village of Leloaloa a little open on the starboard bow, avoiding the reef off Goat Island, until the inner bay is open W. ½ S.; and then stand in mid-channel. There is good anchorage anywhere in the inner harbour, in from 6 to 25 fathoms water, blue mud and sand bottom, excellent holding ground. The best anchorage for large vessels is off Fonga-Tongo, in 20 fathoms. Vessels of 1,000 tons and upwards should not anchor in less than 16 fathoms, as the harbour becomes narrow for large ships to swing at single anchor. A small shoal with 15 ft. on it, bottom of sand, was discovered in 1883, in the middle of the western part of the harbour, at 3 cables E. ½ S. of the northernmost large house at Pago-Pago, with 5 to 9 fathoms close around it.

Sailing vessels will experience no difficulty in entering the harbour, as the trades blow directly in. A good working ship may beat out against the trades, but the harbour is narrow, and lined with coral reefs on both sides, and after passing Goat Island a heavy swell will often be encountered; therefore it would generally be preferable to go out with the land breeze, which usually blows from 2^h to 5^h or 6^h a.m. The only difficulty in going out with this wind is the liability of losing it before getting sufficiently clear of Breaker Point to allow a vessel to wait for the trade wind to come in without the disagreeable necessity of anchoring in from 35 to 37 fathoms of water. The surf always breaks heavily on Breaker Point and on the reef outside of Point Distress, and if a vessel loses the wind before getting clear of these points she had better anchor at once.

During the summer months, from November to May, westerly winds are frequent, and then sailing vessels can get out without difficulty.

It is high water, on full and change, at $6^h\ 20^m$; springs rise 3 ft. 4 in., and neaps 2 feet.

The village of Pago-Pago, at the head of the harbour, contained about thirty dwellings, a council or falatele house, and a large church. It is the residence, also, of a missionary.

Leone Bay is on the S.W. side of the island of Tutuila, about 6 miles from Pago-Pago. The bay is open to the South, and a wind from that direction would make it dangerous; during the summer months, when the trades blow steadily it is smooth and safe. There is considerable level country about this place; it is the most productive portion of the island, abounding in cocoa-nut and bread-fruit trees. There are no outlying or hidden dangers. A vessel may stand in boldly clear of the shore reefs, which extend from 100 to 300 yards from the coast, and are, as usual, well marked by the surf which breaks upon them continually. The best anchorage is in from 20 to 16 fathoms, midway between Rock Point and the opposite shore.

Vailoa, the principal place in the island of Tutuila, is situated in the eastern

part of Leone Bay, and may be easily recognised by a conspicuous Roman Catholic church, built of stone, situated close to the beach, about the centre of the village. Vailoa is fronted by a reef, the boat passage through which is opposite the church.—*Lieut. Bower*, H.M.S. *Danae*, 1880.

Fungasar Harbour is on the North coast, about 6 miles from the West point. It is a sheltered cove, with 10 fathoms water nearly to the shore, and open to the N.W.

Massacre Bay, the scene of La Pérouse's disaster, is on the North side of the island, and from Pago-Pago to the watering cove is a walk of 50 minutes. *Massefau Bay* is about 3½ miles westward of the N.E. point of Tutuila, and faces the N.E. The water in it is deep, 16 to 28 fathoms.

Off the S.E. point of the island is the islet of *Anuu* or *Aunuu*, about a mile in length, having 200 or 300 inhabitants, and off its western point is a single rock above water. Nafanua Bank, extending westward of it, has been before described.

In 1880, a shoal of from 6 to 8 fathoms was reported to lie 1 to 1½ mile S.S.W. of Rocky Point, at the S.W. extremity of Tutuila, and a similar shoal about 12 miles E. by N. of Cape Matutula, the N.E. point of the island. A shoal of from 4 to 5 fathoms is also reported to lie about 25 miles S.E. by S. ¼ S. of the entrance of Pago-Pago Harbour.

The climate of Tutuila is mild and agreeable, particularly at Pago-Pago, where the temperature is lower than it is elsewhere on the island, in consequence of its being overshadowed by the clouds which hang on the land. There is usually a fine breeze, which sets in about 10 o'clock and continues until sunset. There is a good deal of rain during the year, but there does not appear to be any particular rainy season. They are liable to high winds during the winter months.

UPOLU (*Ojalava*, *Oahtooha*, *Ojatava*, or *Opoloo*, as it has been called) is the next in succession to the westward, its East end being 36 miles from Tutuila. It is 37 miles long, by 11 miles in its greatest breadth. It appears much richer and more fruitful than the other islands of the group, and may be described as of moderate height, rising gradually in a succession of wooded ridges from a low shore. Here and there broad and fertile valleys are seen, with numerous streams falling from the mountains in cascades. The eastern portion of the island is much more rugged than the western; the main ridge runs East and West, and ridges or spurs run back to it from the North coast in a S.E. direction. The shore is lined with a coral reef, which is now and then interrupted by channels, and forms snug and convenient harbours. The South side of Upolu, like that of Tahiti, is much more luxuriant than the northern, which is owing to a similar cause—that it receives more moisture from the prevailing winds. It has been the sphere of much useful missionary exertion; and the late Mr. Williams, the well-known author of the interesting Polynesian Researches, lived at Fasetootai, about 20 miles West of Apia, on its North side.

It contains the largest population of the group, about 20,000; the natives are very friendly and hospitable.

Off its eastern end is a small and moderately high island, covered with wood, which La Pérouse called *Ile de Pêcheurs* (Fishermen's Isle), from some canoes employed in fishing when he passed.

The following account of the island is given by Capt. Sir Everard Home, Bart., who visited this part of the Pacific in September, 1844:—

"Approaching the Island of Upolu from the S.E., it appears to be of considerable extent and height, resembling the Island of Timor, the extremities tapering to long points. The body of the island is of very irregular form, being broken into sharp peaks and hummocks, one great chasm appearing to divide the island nearly into two, and one peak is very remarkable; there is, however, a great deal of level land, and land that is in gentle hills and slopes. The island is covered with timber to the top. The scenery of some parts of the South side of this island may be called truly magnificent.

"To run from the East end of Upolu for the anchorage off Apia, a ship should not have less than four hours' daylight before her. It is necessary also to be well to windward, for, with the breezes which blow here, a day may be required to regain the loss of a few hours.

"We ran down the coast W. by N. (from off *Sufibufi*) for the anchorage, which was 15 miles to leeward. Apia lies under the last mountain excepting one from the West end of the island, which terminates in a long, low point. On the mountain under which the village is placed there is a great cataract about one-third from the top; it can be seen from 12 to 14 miles at sea.* Numerous large craters are seen in sailing along the coast. The eastern end of the island is free from coral; sailing westward it gradually increases further from the land than on any other part of the coast; the sea breaks all along its outer edge. We ran down within half a mile of the reef."

Off the S.E. end of Upolu are two islands. The nearest, and appearing to be connected with it by a reef, is *Nuutele*; it is the largest, and has a peak 200 ft. high, and its eastern end is rather bluff. The other, *Nuulua*, is smaller, and has its two extremes nearly alike; it has no peak, but a large round hummock, which may almost be called a saddle. To the northward of these are two other islands, on the reef extending 1½ mile off the coast; at 12 miles N.E. of the easternmost island a bank of 14 fathoms was reported by the German war vessel *Hertha*, in 1877.

Faga Loa, or Fangaloa Bay, lies on the North side of the island, and is about 6 miles from the East end of it. Capt. Bethune, R.N., who had it examined, says:—"Two or three vessels have been in, but I cannot recommend it

* Capt. T. W. Freeman says that the remarks of Sir Everard Home are calculated to mislead a shipmaster; the cataract is not to be discerned until well within the harbour, but there are many *large* cataracts on other parts of the island, visible to seaward.

as an anchorage." It has been condemned by Capt. Wilkes, and an official notification from the American and British consuls, dated Apia Harbour, March, 1846, warns any vessel from entering, except on her own responsibility. It extends in 2 miles to the S.W. ½ W., and the shores are bordered with coral reefs, extending from 1 to 2½ cables off, the depth gradually decreasing from 56 fathoms at the entrance, which is 1 mile wide, to 6 fathoms at its head. A detached shoal, with 14 ft. over it, was reported, in 1880, to lie 3¼ cables N.W. by N. from Lena village upon the South shore.* A shoal of 8 to 10 fathoms is stated to lie 2½ to 3 miles N.E. ½ N. of the East point of the bay.

At 3¾ miles W. by N. of Fangaloa Bay is *Falifa Harbour*, about 6 cables in diameter, with depths of 11 to 6 fathoms. The southern point (*Naneivi*) of the entrance is steep-to, but close off the S.E. end of the reef, on the North side, is a bank with 3 fathoms least water on it. In 1880 a bank, with 8 fathoms on it, was reported to lie 3 miles N.E. of Naneivi Point.

SALUAFATA HARBOUR, situated in a bay 2 miles westward of Falifa, is about half a mile square, protected from the swell by coral reefs, through which the channel is 2 cables wide. It is stated to be the best harbour in Upolu; the northerly swell, which makes vessels roll considerably in Apia in the rainy season, has little effect on vessels anchored in Saluafata. The western side of the bay is occupied by a reef 3 to 7 cables from the shore, upon which are two small sand islets, and having a boat passage inshore of it; cocoa-nuts have been planted on the islets.

On the S.E. side of the harbour is *Ariadne Point*, on which is a white pyramidal *beacon*, with a triangular-shaped head, 114 ft. above the sea, showing well against the wooded hills behind it. Close to the westward of Ariadne Point is *Albatross Island*, another mark for recognising the harbour. It may be known by its black rocky base, and palm trees, but it does not show well against the dark background. There were no palm trees on Ariadne Point.

Ariadne Point in line with the summit of the hill immediately behind it, bearing S. by E., leads into the harbour nearly in mid-channel, and clears *Saluafata Bank*, which lies on the East side of the entrance. This bank, reaching to nearly a mile off the East point of the bay, is nearly connected with the coast reef, and is full of coral heads, the least depth on which is said

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* Shoals.—Two shoals are said to exist off the North side of Upolu; one off *Moatoa*, about 7 miles North, with about 3 fathoms: one off *Utumau*, about 6 or 7 miles due North, also with about 3 fathoms.—*Capt. Worth, R.N.*, 1848.

Westward of Apia Harbour there are several rocky patches lying beyond the main reef; H.M.S. *Blanche*, in 1874, passed over one in about 5 fathoms, with Apia Mountain bearing S.E. by E.

Mr. R. Turpin, master of the L.M.S. barque *John Williams*, reports: that on July 25th, 1874, in lat. 12° 18′ S., long 170° 38′ W. (approximate), the bottom was seen, and 18 fathoms obtained, sand and coral, for a distance of 5 miles in a north-easterly direction. At the time there was a confused and irregular sea, and a large number of fish were seen.

to be 9 ft. It breaks in a north-easterly swell. The N.E. edge of the western reef is said to extend farther East than is shown on the chart of the German survey of 1879, which should be used with caution. A native pilot can be obtained at Saluafata.

Anchorage in 6 to 7 fathoms, fine sand, will be obtained about 2 cables S.S.E. of the eastern of the two small islets before-mentioned; the western part of the harbour is preferable, as being the most sheltered. Fish, fowls, and eggs can be obtained in small quantities; oranges and cocoanuts are abundant. Cattle may be procured from Messrs. Godeffroy's plantation, about 5 miles distant upon the coast. Water may be obtained from a stream in the S.W. part of the harbour. The best landing is at the village of Fusi, in the South part of the bay, through a small opening in the fringing reef, 40 ft. wide. The natives are friendly.

About half a mile to the S.E. of Saluafata Bank is a break in the coast reef, off the village of *Lufi Lufi*. H.M.S. *Danae*, 1880, entered and moored here, but it is small, and should not be entered without a previous examination by boat.

H.M.S. *Danae* obtained a cast of 7 fathoms on a shoal 6 to 7 cables N.W. by N. $\frac{1}{2}$ N. from the western sand kay in Saluafata Harbour. *Nautilus Bank*, of 9 fathoms, lies with Mount Apia bearing W. by S., and Albatross Island, S.E. by S. $\frac{1}{2}$ S., distant about 2 miles.

At 6 miles westward of Saluafata is *Vailele Bay*, which, according to the Imperial German survey of 1879, is an indentation in the reef, sheltered on its East side by a detached reef, with three small islets on it. The bay is about 4 cables in diameter, with depths of $5\frac{1}{2}$ to 9 fathoms; the entrance between the South end of the reef and the shore reef has $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms in it. The land here much resembles that at Apia, and there is a waterfall at the back of the bay; vessels must be cautious not to mistake it for Apia. There is a German cotton plantation here. *Fagalii Bay*, $1\frac{1}{2}$ mile westward of Vailele, is a narrow inlet in the reef, the depth gradually decreasing from 12 to 5 fathoms.

APIA HARBOUR, on the North side of Upolu, and about 9 miles W. by N. of Saluafata, is a reef harbour, the opening into which will show itself, and the eye, with attention to the helm, will be sufficient guide. Steering in, a cataract will be seen right ahead, and, with the village under it, the passage is clear, the depth of water decreasing gradually from 15 fathoms at the entrance to 8 fathoms. The Roman Catholic church, in line with the mission house, S. $\frac{3}{4}$ W., is a good leading mark for entering the harbour. Anchor in 7 fathoms, and moor 30 fathoms each way, East and West. Water here is most abundant and easily obtained, a river running on each side of the town, but supplies are usually rather scarce. *Coal* may generally be procured from a local firm, possessing a coal hulk; in 1875 it cost £3 to £4 a ton.

Vessels staying for any length of time in Apia generally secure with three anchors in the S.E. part of the harbour. The Roman Catholic church spire,

on the South side of the bay, bearing S. ¼ W., leads between the reefs at the entrance, after passing which, steer for the elbow of the shore reef, and let go the port anchor when some stones on the western shore reef which are awash at high water are in line, on about a W.S.W. bearing, with Godeffroy's coal hulk, the reef distant 1 cable; then hard a starboard, veer to about 90 fathoms in the direction of the house marked Macfarlane's store, on the East side of the harbour, and let go the starboard anchor; lay a kedge out astern to the southward. Vessels entering for the first time should take a pilot, otherwise they are likely to foul other moorings.—*Lieut. Bower, H.M.S. Danae*, 1880.

When sighting Apia, some houses with red roofs are prominent objects. They are situated up the hill side, and can be seen before the town or shipping. The town is pleasant, and is under the control of the Europeans, headed by the three foreign consuls. Two churches, a saw-mill, and other good buildings, are among the improvements of the place. Near the English church are deposited the remains of the lamented missionary, Mr. Williams, and of Mr. Harris, brought from Erromanga.

Captain Thomas W. Freeman, commanding the *Resolute*, writing January, 1870, says:—There are no wharves, lighters, store-houses, or convenience for heaving down, no reliable labourers, the natives being unwilling to work at any time. Apia, though small, is an excellent little harbour, and there is a good pilot who boards you well to windward. The usual trade wind is fair in or out; ships should moor with two anchors East and West, and a kedge to keep from swinging during the night with the land breeze. There is a large trade with Hamburg, Apia being the central depôt, where is collected cocoa-nut oil, coprah, cotton, pearl-shell, &c., the products of the islands of Western Polynesia. This trade is almost entirely in the hands of John Cesar Godeffroy, of Hamburg.

The pilotage is 1 dollar a foot, in and out, and is compulsory, besides which there is a small quarantine fee. In 1882, 142 merchant vessels, with a total tonnage of 26,384, entered this port, of which 110, tonnage 20,556, were German. The value of the exports in 1882 amounted to about £48,450, chiefly coprah and cotton; the imports were valued at £60,785. The currency is Chilian gold and silver, and debased Bolivian silver coin, the latter being only worth 3*s.* a dollar.—*Mr. Consul Churchward.*

Dr. Gräffe's description of the harbour of Apia, in the *Journal des Museums Godeffroy*, is worth reproducing:—"Small as the harbour is, it presents a busy picture. Fishing craft are sailing in and out every day: larger vessels, and even men-of-war of various nations, are to be seen, while boats and canoes traverse the bay in every direction. The 'heave-ho' of the sailors mingles with the native boat-song, from the quays and shores rise the confused cries of almost every conceivable race, and even when on land one hears the working and whistling of marine engines. Bands of natives are frequently going

through the streets laden with the vegetable produce of the islands. In the evening the natives sing and dance to the accompaniment of drums and castanets."

A shoal, with 7 to 9 fathoms over it, is reported to lie 3 to 4 miles N.E. from the N.E. point of Apia Harbour reef; another, of 9 fathoms, about 2 miles N.E. by N. of the East point of the harbour; and another of 7 fathoms lies in the entrance to the harbour. A shoal of 7 fathoms lies about 2 miles from the shore, with the Roman Catholic church bearing S. ¼ W.; and another, of 9 to 13 fathoms, about 1½ mile N.N.E. of the last.

At 4 miles W. by N. ½ N. of Apia Harbour is *Falooloo Point*, off which the shore reef extends 2 miles N.E. by N. ½ N., and N.W. of the extremity of the reef are some sunken dangers, with shoal water of 3 to 3¾ fathoms. Shoal water has been found extending off the shore, in a northerly direction, from Falooloo Point westward. At 2⅛ miles N. ½ W. of the point, 4½ fathoms was obtained; at 3¼ miles N.W. ¼ N. of the same point, 7¼ fathoms; and at 2¼ miles N.W. ¼ W. of Salafuata Point, 12 miles W. by S. ½ S. of Falooloo Point, 7¼ to 8 fathoms. A great deal of discoloured water was observed in the bight between Apolima Island and Salafuata Point, from the deck of H.M.S. *Pearl*, 1876. Vessels, therefore, should not approach the North coast of Upolu, westward of Apia, nearer than 3 miles.

MANONO ISLAND is enclosed within the sea reef of Upolu, at its West end, and was called by La Pérouse *Platte Island*. It is covered with forests throughout its whole extent, and is about 4 miles in circumference. It has about 1,100 inhabitants, and is the station of an English missionary. It is identified with the political history of all the other islands of the group, and has held the supremacy. This is owing to the possession of the natural fortress of *Apolima* (Aborima, or Poreemo), lying between Manono and Savaii. This is evidently the crater of an extinct volcano, and is a ring of perpendicular cliffs, broken down at a single point on its northern side, affording a passage for only one boat at a time to a basin within. Its highest part is 472 ft. above the sea; and in the centre of the island is a native village. Soundings extend to it from Savaii and Upolu. The coral reef attached to it is but small. Kotzebue calls it the *Cock's Comb* (Crête de Coq).

The distance from Manono to Apolima is about 1½ mile; from the West end of Manono the reefs extend about half a mile, terminating just beyond a small islet, called *Nulopa*. The remainder of the channel appears clear. H.M.S. *Conway* ran through it. From Nulopa the reef runs to the S.E., and at 1½ mile S. by W. of the peak of Manono Island, a depth of 5 fathoms was found outside the reef.

M. Dutaillis advises vessels proceeding to the West to pass rather to the North of Savaii than through the channel separating this island from Upolu, at least to gain a steady breeze. You are drifted in it by strong currents. In the night of the 4th to the 5th of December, 1847, during a dead calm,

he was obliged to get the boats out, and to tow the vessel off Apolima, on which the swell and the current were driving her.

From Apolima to Savaii, the westernmost of the group, the distance is about 5 miles, 3 miles of which are clear for ships. About one-eighth of a mile North of Apolima is a small rock, and the reef runs off from Savaii 1½ or 2 miles.

At 5 miles E.S.E. of Manono is a break in the reef at *Falilati*, and at 4 miles further is *Lafanga*, a good harbour for boats. At 8½ miles beyond Lafanga is *Safatu Harbour*, the principal harbour on the South side of Upolu, but it requires caution in entering it. At 8 miles beyond Safatu is *Falealili Harbour*, very small, and obstructed by outlying reefs; there is a large native town here. From hence to the S.E. point of Upolu the shore reef appears to stretch but a short distance off.

SAVAII is the westernmost and largest, though not the most important, of the Samoan group. Captain Edwards, of the *Pandora*, calls it *Chatham Island*. It is called *Shavièe* and *Oteewhy* by La Pérouse, and *Pola* by Kotzebue and others.

It is about 40 miles in length and 20 miles in breadth. It differs from any of the others in its appearance, for its shore is low, and the ascent thence to the centre is gradual, except where the cones of a few distinct craters are seen. In the middle of the island a peak rises to 5,400 ft., which is almost continually enveloped in clouds, and is the highest land in the group. Captain Wilkes saw it at the distance of between 50 and 60 miles.

The interior of the island is rarely entered, even by natives, and has never been penetrated by strangers; it is utterly sterile, being occupied by lofty and barren mountains, interspersed with rocky and lava-covered plains. Captain Sir Everard Home says that Savaii is the finest and most valuable island he had seen. It produces, spontaneously, the citron, nutmeg, indigo, coffee, and sugar-cane.* The only settlements are on the shore. Another marked difference between Savaii and the other large islands is the want of any permanent streams, owing, perhaps, to the porous nature of the rocks. Water, however, gushes out near the shore in copious springs.† The coral reef attached to this island is interrupted to the South and West, so that the surf beats full upon the rocky shore. There are, in consequence, but few places where boats

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* M. Dutaillis says there is a tree found in the archipelago which possesses a remarkable property: it is called *Mamorea*, and the men who work it become intoxicated; animals which lie on the wood are also much affected by it.

† Captain Sir Everard Home says the water comes from the hills in such great torrents, that its counter-action, flowing out, beats down the sea rolling in; the harbour thus is kept quiet, and the ship rises to the fresh. In this way ships will ride out the heaviest gales in perfect safety, without lightening their cables, which, he was informed, was the case when the American squadron were in the harbour in 1840.

can land, and only one harbour for ships, that of *Mataatu*, but this is exposed to N.W. gales. The natives are a somewhat turbulent set of men.

The South side of the island is rocky and iron-bound, with a heavy surf breaking on it. Towards the western end of the island the rocks around the points are worn into cavities, and the sea rolling into them produces innumerable spouts of water.

Near the East point of the island is the large *Bay of Paluale*, a missionary station. The village is approached by a boat passage through the reef. Vessels wishing to communicate with the village, will find fair anchorage in N.E. winds, outside the eastern part of the reef extending off Paluale, with a conspicuous hill, 550 ft. high, at the S.E. end of Savaii, bearing East, at about 4 cables from the reef, in 24 fathoms, sand.

Near the low rocky N.W. point of Savaii is the large and beautiful village of *Felialupo*, with a snug little cove for boats. A native missionary resides here. About 5 miles S.E. of it is the village of *Falelima*, which has a white house in its centre and another at its southern end. Boats can land here in fine weather at high water, but there is no anchorage. The next inlet on the North side is that of *Asaua*, a small and shallow entrance through the reef, forming within an extensive flat. *Safoonè Road*, 15 miles E. by N. ½ N. of Asaua, affords anchorage in 13 fathoms during S.E. winds, but there is usually much swell.

Mataatu Bay is at the N.E. end of the island, and affords good anchorage, and it is the only place in the island where a vessel can stay with safety. Supplies of hogs, poultry, and vegetables may be had in abundance; wood and water are easily obtained, the latter from copious springs near the beach. The bay is surrounded by a white coral beach, and the town of Mataatu is beautifully situated in an extensive grove of cocoa-nut trees. The houses are about 400 in number, and the people about 2,000, most of whom are heathens, but are courteous.

The Bay of Mataatu is much exposed at all seasons; but between December 1st and the end of March, when North and N.W. winds prevail, it is quite dangerous, and should not be visited.

Captain Hope, R.N., says (1866), that "vessels intending to anchor off Mataatu should give the reef which projects from the eastern point a berth of half a mile, as there is shoal water off it, perhaps a continuation of the reef; the *Brisk*, rounding the reef at a distance of 2 cables, had 5 fathoms water, and there is said to be less." H.M.S. *Danae*, 1880, also obtained 6 fathoms when 1½ cable distant from the reef off the western point.

M. Dutaillis says that all along the North coast, at the distance of 2 or 3 miles, bottom may be found at the depth of 9 to 14 fathoms.

On the S.E. side of Savaii are two boat passages through the reefs, the northern, opposite Sapapale, being bad; the Suulu Passage is the best, but several shoal patches lie off its entrance.

From information given to Captain Worth. R.N., in 1848, a *shoal* is said to exist about 40 miles West of the West point of Savaii.

NIEUE', or Savage Island, was discovered by Captain Cook, June 20th, 1774. He landed easily in a small creek on the West side, and taking post on a high rock, to prevent surprise, was attacked, both here and at the point, by the natives, "with the ferocity of wild boars." This reception occasioned its name. He describes it as about 11 leagues in circuit, of a round form and good height, and is steep-to. All the sea-coast, and as far as could be seen, was wholly covered with trees and shrubs, among which were some cocoa-nut trees. To judge of the garment by the skirts it cannot produce much, for so much as we saw of it consisted wholly of coral rocks all overrun with woods and bushes. The cliffs which bound the shores are of coral stone, which the continual beating of the sea has formed into a variety of curious caverns, some of them very large; the rock or roof over them being supported by pillars, which the foaming waves have formed into a multitude of shapes, and made more curious than the caverns themselves. Its South point is in lat. 19° 10′ S., long. 169° 50′ W.

Captain Erskine, R.N., passed it in July, 1849, and found the natives who came on board quite trustful and harmless, but apparently quite ignorant of Europeans. The island is long and low, not more than 200 ft. high at any point, covered with scrubby trees. It is about 9 miles long N.W. and S.E. The N.W. point is in about lat. 19° 0′ S., long. 169° 50′ 40″ W. No signs of huts or cultivation. In 1852 the Swedish frigate *Eugenié*, lying-to off the island, had some books and some English ships' articles offered, which had either been wrecked or plundered.*

"About twelve vessels visit Niué yearly, mostly brigs and schooners under the German flag, and a few whale-ships for supplies; these carry the produce to Apia, or to Sydney, which consists of cotton, fungus, and cocoa-nut fibre; cloth, calico, knives, axes, &c., being the medium of exchange. Money is only given for labour. The population in December, 1872, numbered 5,124.

"The natives are good-tempered, cheerful, and industrious. They are quite different in appearance to the natives of the Cook Islands, being smaller and darker in complexion, and speak a language entirely of their own, more allied to the Samoan dialect. It is worthy of remark that the Niuëans were never cannibals."—Commander Mainwaring, H.M.S. *Cameleon*, 1873.

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* *Three islands* are marked on Arrowsmith's chart, in lat. 18° 8′ S., long. 169° 20′ They are said to be populous. They are not known to any one at the Samoan group, and Capt. Erskine was satisfied that they did not exist within 60 miles of the assigned positions He suggests, that as Savage Island appears somewhat as three islands in one position they are intended for that, with an error of 1° in lat.

BOSCAWEN ISLAND, Niua-Tabu-Tabu, or Cocos, is one of two islands to the northward of the Friendly Islands. They were discovered by Le Maire and Schouten, May 11, 1616. The last name was given by Wallis, 1767. It is a high island, one entire mountain, resembling the Moluccas, and covered with cocoa-nut trees; hence the name given by Schouten. It is about 2,000 feet high, and had only one small village on it in 1873, at the time of H.M.S. *Basilisk's* visit. It is in lat. 15° 52′ S., long. 173° 50′ W.

KEPPEL, or Verraders Island, the other, is much lower, and of greater length, and lies 5 or 6 miles nearly S. by W. (S. by E. ?) from Keppel Island. The ships which discovered it, having anchored off it, began some friendly intercourse with its inhabitants, which having continued to some extent, they became bolder, and approached apparently pacifically, with 700 or 800 men, but began to attack them. Hence it was called Verraders, or *Traitors' Island.* Captain Wallis called it *Keppel Island.* Its position is about lat. 15° 56′ S., long. 173° 50′ W.

On the North shore there is an extensive coral reef with a lagoon inside; the passage, by which the *Basilisk's* boats entered in 1872, piloted by a native was not accessible for ships of any size, nor does there appear to be any safe anchorage off the island. A dangerous coral reef extends for about a mile off its S.W. end. Keppel Island, together with Boscawen, was subject to King George of Tonga, and contains a population of about 1,000. The white inhabitants live at the S.W. end of the large island, where there are two flagstaffs, flying respectively the English and German flags. A governor from Tonga and a native missionary reside on the island. Cocoa-nuts, yams, plantains, and pigs are in great abundance.

The following information is given from the report of Lieut. Bower, H.M.S. *Danae*, 1880:—The large Keppel Island is about 3 miles long, N.E. and S.W., by about a mile in breadth; it has a general height of 90 ft., with a square-shaped hill in its centre, 350 ft. high. *West Island* lies a quarter of a mile off its S.W. end, and is three-quarters of a mile long and 70 ft. high. At 1 mile W. ½ S. from the N.E. end of large Keppel Island is an islet 20 ft. high, standing on the edge of the barrier reef, which extends about half a mile off the N.E. point of Keppel Island, and follows the line of coast to this islet, where it is three-quarters of a mile off shore; it then takes a short curve in, and runs out again, forming an elbow about one mile off shore, after which, it curves in towards the West end of West Island, off which it extends about half a mile.

A dangerous off-lying reef, on which the sea was breaking, lies about 2 miles from the coast, with the S.W. peak of Keppel Island bearing S.E. by E. As this reef lies right under the lee of the island, it probably does not always break.

Between Twenty Feet Islet and the N.E. point is a lagoon, into which no passage for boats could be seen at low water; a boat from the *Danae* landed in the bight West of the islet, but there is said to be better landing at the

S.W. end of the large island, close to the flagstaffs. H.M.S. *Danae* had 21 fathoms at two thirds of a mile N.W. of Twenty Feet Islet; a vessel would probably not have much difficulty in finding anchorage in the neighbourhood during S.E. winds.

Curacoa Reef was discovered by H.M.S. *Curacoa*, July 11, 1865. The sea was breaking heavily on it. Further information respecting the reef states that it is a dangerous coral patch, not always showing its position by breakers, about 60 yards in extent. Lat. 15° 31′ S., long. 173° 44′ W., and 16 to 20 miles E.N.E. of Boscawen Island. The *Ten-fathoms Bank*, sounded on by H.M.S. *Curacoa*, lies about 9½ miles S. 38° E. from the reef, and in lat. 15° 40′ S., long. 173° 40′ W.

NIUA-FU, or *Proby Island*, was discovered by Capt. Edwards, in the *Pandora*, and is probably the *Goede Hoope Island* of Schouten, who says this island is full of black cliffs, whose tops were covered with vegetables, and well stocked with cocoa-nut trees. The *Consolation Islands*, discovered by Maurelle, are hereabout, possibly the Cocos and Verraders Islands. *Brinsmade Island* is probably the same. It is said to have been discovered in 1840 by Captain Wood, of the *Richmond*.

Niua-fu, according to Capt. Charles Hope, H.M.S. *Brisk*, 1867, is a volcanic island, nearly circular, 3½ miles from North to South, and 3 miles from East to West; it is about 500 to 600 ft. high, and well wooded to the summit. The centre of the island, an old crater, is filled with brackish water, in which are hot springs, and traces of volcanic action are everywhere to be seen. A severe eruption took place in 1853, when a village was destroyed and many lives were lost; and on April 12th, 1867, another eruption occurred, but without loss of life. The cocoa-nuts grown on this island are remarkably fine, equalling those of Rotumah. The inhabitants, 1,200 in number, are Tongese Christians; the church and the teacher's house are neat and well built.

There is only one spot where a vessel can anchor; this is on the West side, where a depth of 15 fathoms may be found at a distance of about a cable from the shore, with a sandy bottom; but it is too close in to be a safe berth. Black lava rocks line the shores all round the island, and landing is at all times difficult and hazardous. The principal landing-place lies on the N.E. side of the island, but was unsuccessfully tried by the boats of H.M.S. *Basilisk* in 1872. It is marked by a flagstaff, and 2½ miles eastward of it is a small boat harbour.

The N.W. extreme, where the principal village is situated, lies in lat. 15° 34′ S., long. 175° 40′ 40″ W.; no bottom could be obtained with 130 fathoms of line a mile off this point.

Zephyr Reef.—Capt. Wilson, schooner *Zephyr*, 1876, reports having sounded upon a sunken reef in 15 fathoms (afterwards drifting into shoaler water,) in lat. 15° 58′ S., long. 177° 10′ W., in the channel between Niua-fu and the Fiji Islands; but H.M. Ships *Sapphire* and *Alacrity*, could not find it in

this position. The natives of Fotuna state that there is a large rock awash upon it.

Captain Carmichael, of the schooner *Louisiana*, states he passed over a reef in lat. 15° 57′ S., long. 176° 56′ W., sounding thereon in 15 fathoms. It appeared to extend about 5 miles to the S.W., and in some parts to have less than 6 ft. over it. H.M.S. *Pearl* in 1876 found a depth of 5½ fathoms in lat. 16° 0′ 20″ S., long. 177° 6′ W., which position bears S. 59° E. (*true*), 4½ miles from the position of Zephyr Shoal as originally reported. It seems probable that these different authorities are dealing with the same extensive reef; the position given by the officers of H.M.S. *Pearl*, being considered the most trustworthy, will be retained for the present as the accepted position of Zephyr Reef.

Home Bank, or *Lalla Rookh Bank.*—Sir Everard Home, in H.M.S. *North Star*, in September, 1844, left the Samoa group for the westward, and looked for a shoal between them and the Wallis Islands, but could get no bottom with 100 fathoms in the reported position. But on the following day, at noon, they were upon one of great extent; the depth of water 13 fathoms, nor did it appear to have less. No broken water could be observed. The latitude, by observation, was 12° 53′ 8″ S., long 175° 31′ W. Capt. Reynard, American whaler *Lalla Rookh*, says it is about 6 miles long E. by N. and W. by S., and 4 miles broad. A depth of 10 fathoms was found, but in many parts there appeared to be less. H.M.S. *Alert*, 1880, sounded in 11 fathoms, coral, in lat. 12° 55½′ S., long. 175° 40′ W., or about 9 miles westward of the above position.

UVEA, UEA, or *Wallis Island*, was discovered by Wallis in 1767, and it is probable that it is the same as that discovered by Maurelle, April 22, 1781, and which he places more than 3¾° to the East. Wilkes says that instead of a single island, as might be expected from the name, there are nine separate islands, varying in circuit from 1 to 10 miles, and enclosed within one extensive reef. The land is in general high. The entrance to the lagoon is on the South side of the group, and it is stated that there is ample room for a ship to pass within the reef. Wood and refreshments, pigs, yams, bananas, &c., may be obtained, but water is scarce.

Uvea is 7 miles long North and South, and 197 ft. high near the centre, but is surrounded by a reef 14 miles in extent North and South, and 9 miles East and West. Off its North and East sides are some islets, and also at its South end are some others; between the two to the S.W. is the Houi Kolou entrance to *Allièr Bay*, the anchorage. On the starboard side is the islet of *Fenua-fu*, or *Felletoa*, in lat. 13° 23′ 35″ S., long. 176° 11′ 47″ W. The depth in the entrance is 13 to 20 fathoms, and it is not more than a cable wide, running in a N.N.E. direction. *Mua*, the French missionary establishment, is on the South point of the island. The town of *Matautui* is on the East side of the island, and here is the residence of the queen.

The island is divided between Protestants and Roman Catholics. A Roman

Catholic bishop has settled here, and made these islands a centre from which to spread that religion.

The following is the French account of it:—The Island of Uvea is the only one inhabited, having about 3,000 inhabitants. The others, infinitely smaller, which are grouped around it, are only, properly speaking, places of relaxation, where the sick or invalids go to breathe a purer air, and to get beyond the reach of the myriads of troublesome mosquitoes.

If you wish to repair the ship, or take much water, or to refit, it would be better to take the anchorage where the *Embuscade* was half rebuilt, and where the *Arche d'Alliance* was partly hauled on a sort of gridiron. Some coral banks separate these two points, but they show themselves by the colour of the sea, and leave between them a very fine channel.

"Of the four entrances through the reef, three are reported available for large ships, but the best entrance, and that which hitherto has been solely used, is the southern one. The inhabitants of the island are governed by a native queen."—H.M.S. *Basilisk*, 1872.

The following remarks are made on it by Capt. Sir Everard Home:—

"At daylight, on September 5th, 1844, stood in, and soon after saw the island bearing N.W.; it is of moderate height; the surface varied; one hill is seen of irregular form and higher than the rest; eastward of it there are islands extending to a considerable distance. Drawing in with the land from the southward, a long, low island (*Faioa*) appears eastward; and westward the hill above mentioned, with a long island on each side of it. They are all covered with trees, particularly cocoa-nut. The remarkable rock, *Nuku Akimoa*, called the *Sail Rock*, from its exact resemblance to a boat under sail, whichever way it is viewed, was reported as a boat coming out; the village was seen, and appears to the naked eye like a cliff, or patch of barren rocks amongst the green foliage which surrounds it.

"Being to windward, and no boat coming off, at half an hour before noon we ran down westward to the small island, round which was the entrance between it and the hill on Nukatea, before mentioned. Soon after noon a pilot was received, a native of France; at 3 P.M., when it was slack water, stood in N. by E. ½ E. for the opening, a channel of about 120 yards in width, through which the tide runs at the rate of about 8 miles per hour. Great attention is required at the helm; the length of this narrow channel is about a quarter of a mile.

"Having passed the reef, haul up N.E. by E. Two patches of coral will be seen; pass between them; that on the starboard hand will have 14 ft., the other 5 ft. water upon it; care must be taken to avoid the other light-coloured patches, for they are coral reefs and shoals; the eye will be a sufficient guide. The remarkable rock above mentioned will then be seen ahead; the anchorage is about a quarter of a mile South of it, in 22 fathoms, sand and coral; it is not good, the bottom being of coral mixed with sand; the anchors hooking

the coral are frequently lost, but the danger of the passage in or out, caused by the force of the tide making through the narrowness of the channel, is a sufficient objection to it. The South side of the harbour is bounded by a line of low sandy islands, connected by coral reefs, upon which the sea continually breaks with violence. The land North, which is the largest of the group of islands, is high and apparently productive; the islands are all well wooded."

Capt. C. W. Hope, R.N., H.M.S. *Brisk*, adds, "The channel up to the inner anchorage is very tortuous between patches of coral, but in favourable weather they are easily seen, and present no difficulty to a steam-vessel; a ship should not, however, proceed to the upper anchorage without a pilot if one can be procured."

The following is from information published by the French Government in 1879.

The southern opening in the barrier reef is practicable for a steamer, but sailing vessels should not enter, unless with a fair wind, and upon the first of the flood tide. Upon the West side of the pass, the wreck of the *L'Hermite* will be seen. Having arrived off the pass at low water, bring the S.E. point of Nukuatea Island to bear N.N.E., and open to the westward of Fenua-fu Island, which mark will lead in. Care should be taken to give the North point of Fenua-fu a berth of at least $1\frac{1}{2}$ cable. Upon the ebb tide there are strong eddies, which must be crossed with speed, and borrowing upon the western side of the pass, both upon entering and leaving. The tide has been reported to run at the rate of 8 knots an hour, but recent observations give a maximum of 6 knots; slack water lasts about 15 minutes.

Native pilots from Mua will board the vessel off the pass, but they are unaccustomed to large vessels. The charge for pilotage is 10 piastres each way.

When bound for the anchorage in Allier Bay, and well within the pass, steer for the North point of Faioa Island, and when Sail Rock bears N. $\frac{3}{4}$ W., and the South point of Nukuatea W.S.W., anchor in 22 fathoms, sand and coral. This anchorage is, however, inconveniently far from the shore.

There are two channels to the anchorage off Mua, one to the East, the other to the West of Nuku Akimoa. The commander of the *Vaudreuil* recommends the eastern one; to take which steer as directed for the anchorage in Allier Bay, until the West point of Nuku Fetau bears N.N.W., when the channel between the banks extending eastward from Nuku Akimoa, and a reef with 1 fathom over it will be seen. The channel first takes a W.N.W. direction, and when the West point of Nuku Fetau bears N. $\frac{3}{4}$ W., steer for it until Nuku Akimoa bears S.W. $\frac{3}{4}$ S.; then alter course N.W. $\frac{3}{4}$ N. for the anchorage in 8 fathoms, sand, with Mua steeple, a dark-coloured stone among the trees, bearing N.W. by N., distant 1 mile from Mua village. Landing is difficult at low water.

There is anchorage off *Matautui* village, on the East side of the island,

which can be reached by an intricate channel (in which the tide runs 4 knots) from Allier Bay, near the North extreme of Faioa Island. A local pilot and a good look-out from aloft are the best guides. Landing is easy at high water, a little North of the church. At 2 miles North of Matautui the channel is completely obstructed by sand-banks.

During June, July, and August, the prevailing winds are between E.S.E. and N.N.E. Breezes from the North or N.N.W. are accompanied with squalls and rain.

It is high water, on full and change, at $6^h\ 40^m$; springs rise 6 ft. The sea washing over the barrier reef sometimes makes the tide irregular.

FUTUNA, or Hoorne Islands.—*Futuna* and *Alofi* (*Allufatti* of former charts) were discovered by Le Maire and Schouten, May 19th, 1616. They anchored on the South side of one of them, but do not say which, in a bay to which they gave the name of *Eendraght*. Mount Schouten, their highest point, is 2,500 ft. above the sea; on its northern side many rocks are visible, and the whole surface appears bold and precipitous, affording, as far as could be perceived, little soil for cultivation. Cocoa-palms in considerable numbers are seen on a low point projecting from its southern side. Water and provisions in abundance may be procured. The islands have a population of 1,100 inhabitants. Those of Futuna are about 1,040 in number.

The island of *Futuna* is 7 miles long and 5 miles broad. It is under the sovereignty of two kings, both of them Roman Catholics, like their subjects. One of them was the famous Sam, the ex-disciple of the unfortunate Père Channel. This Sam sailed several years with the English and Americans. Mount Schouten is in lat. 14° 14′ 20″ S., long. 178° 7′ W.*

"The principal village and a large church are seen on the N.E. side of Futuna, situated in cocoa-nut and bread-fruit tree groves, extending for 4 or 5 miles along the coast, the entire length of which is fringed by a flat shore reef, on which the surf with the prevailing winds breaks heavily. The boats were unable to land; canoes passed readily through the surf with passengers, but in returning to the boats they were repeatedly swamped.

"The harbour, situated on the S.W. part of the island, is open to the S.W. but sheltered from all other winds; it is comparatively easy of access, but some sunken patches of coral render the services of a pilot advisable. A large white cross is placed on a hill on the South side of the harbour, to guide vessels in. The anchorage is on a sandy bottom, with 6 to 8 fathoms from 100 to 200 yards from the shore; at 400 yards there is 18 fathoms. Very few inhabitants live on the northern side of the island."—H.M.S. *Cameleon*, 1872.

Alofa, to the S.E. of Futuna, rises to the height of 1,200 feet.

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* L'Enfant Perdu is an island discovered by Bougainville, May 11th, 1768, but only seen at the distance of 7 leagues. There is not any doubt but that it was the Hoorne Islands of Le Maire and Schouten, although placed by him 1½° East of their position.

CHAPTER XIV.

THE FIJI ISLANDS.

This British Possession is one of the largest and most beautiful archipelagoes in the Pacific Ocean. In former years it has been of minor importance to the commercial world, from the character of the people inhabiting it.

It is to Tasman that we owe the discovery of the Fiji Islands. On Feb. 6, 1643, he saw eighteen or twenty small islands, surrounded by rocks and reefs. He called his discovery Prince William Islands and Hemskirk Reefs. These probably were in the eastern part of the group. The next navigator who visited them was Captain Bligh, in 1789, during his boat voyage after the mutiny of the *Bounty*. The southernmost of the group, Turtle Island, was discovered by Cook in 1773. Captain Wilson, in the missionary ship *Duff*, visited them in 1797.

Captain D'Urville, in the *Astrolabe*, in 1827, spent seventeen days in examining the group, of which he furnished a far more exact knowledge than had been previously acquired.

It is to the United States' Exploring Expedition, 1840, that we owe the first most complete nautical account of this beautiful archipelago, and it is from the third volume of the narrative of their proceedings that some part of the ensuing descriptions have been derived.*

There is one unpardonable blemish in Captain Wilkes's account of this group; he makes not the slightest allusion to any of his predecessors in exploration—most assuredly a very necessary, yet simple, duty. The only mention made of any other labourers in the same field is in terms of would-be disparagement, unworthy of so important an expedition. It is sufficient here to

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* "We found the position of all the reefs and shoals through and amongst which we passed very correctly laid down in Capt. Wilkes' charts of the American Exploring Expedition, with the exception of Turtle Island, about which there is evidently some mistake, and the reefs and shoals within the Bay of Ambau. His description, also, of the islands, of the appearance, habits, and customs of the natives, is very faithfully delineated."—*Captain Worth, R.N., H.M.S. Calypso.*

mention this: it is too obvious, on every page of this volume, to any one at all acquainted with other authorities.

Since then they have been visited and partly explored by Sir E. Belcher, H.M.S. *Sulphur*, in 1840; Capt. G. Worth, H.M.S. *Calypso*, in 1849; and Capt. H. M. Denham, H.M.S. *Herald*, in 1854-6, and still later by Lieuts. W. U. Moore and L. S. Dawson, H.M.S. *Alacrity*, in 1876-80. The information thus obtained has been incorporated in the ensuing description. The northern shores of Viti Levu and Vanua Levu, and the adjacent islets and reefs, have not yet been surveyed in detail.

The island which gives its name to the group is called by the natives Viti Levu (Viti Levu, D'Urville, &c.), that is, Great Viti. The Fiji islanders call themselves *Kaï-Viti*, in the same way that they call the inhabitants of Tonga *Kaï-Ton-ha*, and *Kaï-Papalan-hi* all civilized people, or rather, all their visitors who *wear clothes*, and it is only these three races that they are acquainted with. The origin of the name *Fiji*, *Fidji*, *Fidjee*, or *Feejee*, is probably due to the Tonga Islanders, who thus pronounce the word "*Viti*."

The archipelago consists of about 255 coral and volcanic islands, containing a total area of 8,034 square miles, nearly equal to that of Wales. About 80 of the islands are inhabited. The eastern or Weather group is locally known as *Lau*. The natural productions of the islands are numerous, and a country more suitable for the production of cotton could hardly be found.

The first proposition to cede the sovereignty to the English crown, or to make it a colony, was formally made by Thakombau, chief of Bau, &c., by a deed, in October, 1858, and which proffered cession was brought over by H.M. Consul Mr. Pritchard, in 1859. In order more fully to investigate the nature of the cession and its advantages, H.M. Government sent over Colonel Smythe, R.A., in December, 1859, as commissioner. Besides this enquiry, H.M.S. *Herald*, Captain Denham, also made many examinations, and Dr. Berthold Seemann, well known as the botanist, has given a report on its productions.

The inducements and reasons offered in support of this cession, were the importance of the commerce that might be developed in the Archipelago, its rich productions, the power of suppressing the ceaseless wars and the many fearful and repulsive practices of the natives, the payment of a claim made by the United States' Government, the formation of a depôt for the trans-oceanic commerce which might arise between Panama and Australia, and to have a military stand in the great ocean where the French and Americans have done much to establish such a power. The result of this offer being that the British government refused the sovereignty, power was given by King Thakombau to Mr. Consul Pritchard, and he acted as governor.

The "Polynesian Company" was formed at Melbourne, and a treaty signed on the 23rd of July, 1868, gave into their hands 200,000 acres of land, in return for which they paid the debt to the United States' Government, and were

to allow the king £200 a year. In the end the project was a failure, but many emigrants were induced to come as settlers to the islands.

In 1869 a government, similar in constitution to that of Great Britain, was formed, which only proved a trouble, but it existed until another offer to cede the government being strongly urged by both natives and settlers, it was finally accepted, and the islands were formerly ceded to Great Britain on September 30th, 1874, Sir Hercules Robinson, Governor of New South Wales, having on that day accepted the government of the islands in the name of Her Majesty, at the Government Buildings, Nasova. The king, his chief ministers, and nine chiefs were present. On June 25th, 1875, Sir Arthur H. Gordon, the first governor, landed at Levuka. The chiefs are still allowed to maintain their authority with the natives.

In 1880 there was a monthly mail service between Sydney and Levuka, and another with New Zealand, and there is also monthly steam communication with the various islands and Tonga. In 1883 there were three clearing ports in the colony, viz., Suva, Levuka, and Lauthala, at one of which a vessel from abroad must touch for pratique, before being allowed to communicate with any other part. Such vessels must hoist a yellow flag or a green light at the mast-head until she be admitted to pratique. Loma-Loma was formerly a port of entry, but it was closed in 1882. The sale of intoxicating liquors to the natives is forbidden under heavy penalties.

Although cotton had been produced in small quantities for some years previously, a great impetus was given by the stoppage of the supply from the United States during the American war, and in 1867 the value of the export was £34,000. In 1873 the export was 700 tons, but of late years the cultivation has much fallen off, in consequence of the great decrease in its value Coffee grows well on the mountain sides; sugar-cane flourishes, and its cultivation is being largely extended. Yams, taro or daro, bananas, plantains, bread-fruit, and cocoa-nuts, are grown by the natives for food, and a variety of European vegetables have been introduced.

The exports, consisting principally of copra, sugar, cotton, and biche-de-mer, were valued at about £120,000 in 1874. In 1881 the value of the exports amounted to £174,145, including 7,532 tons of copra valued at £87,048, 298 tons of cotton valued at £35,100, 684 tons of sugar valued at £23,254, and coffee valued at £4,666, the export of the two latter articles being likely to largely increase in future years as the plantations are extending. The imports for the same year amounted to £276,039. The currency, and legal weights and measures, are exclusively British.

In 1866, the number of vessels entered was 26, with a tonnage of 4,024 tons; in 1870, 167 of 15,490 total tonnage entered, and all but two were British. In 1881, 164 vessels, with a total tonnage of 35,542, entered, of which 129, with a total tonnage of 27,023, were British.

Of the *natives* we cannot speak here in detail. They are of a different

complexion to their neighbours, the Tonga Islanders, being nearly black. Their language, of which different dialects are in use throughout the group, is generally of a Polynesian character. They are a fine race of men, and doubtless possessed of many good qualities, but they are pre-eminently blood-thirsty, ferocious, and cruel. Cannibalism was formerly indulged in to an incredible extent, and this, not from the mere satisfaction of revenge, but as an appetite—friend, relation, or foe, equally affording food to the more powerful. The ample descriptions given by D'Urville, Wilkes, and others, will furnish details of their revolting habits and customs. These degrading features, however, are rapidly passing away under the influence of the Christianizing efforts of the Wesleyan missionaries who first came from Tonga in 1835.

All Fijians are nominally Christians, the majority having embraced the Wesleyan faith. In 1881, there were, throughout the whole group, 776 Wesleyan churches, 1,760 day-schools, 8 European missionaries, with numerous native ministers and teachers. The number of Roman Catholic Church members is about 8,000.

The numbers inhabiting the group of course could not be very closely estimated till of late years; M. Gaimard making it 70,000, whilst Wilkes raised it to 133,000, and the estimate of Mr. Pritchard and Colonel Smythe, in 1861, made it 200,000, of whom 60,000 were Christians. Mr. Thurston, H.B.M. Consul, estimated these numbers in 1867 at 100,000, and gives several reasons to which their rapid decrease may be ascribed. About one-third of the population was thought to have been destroyed by the measles imported in 1875 by H.M.S. *Dido*.

In 1874 the total population was estimated at 140,500; Vanua Levu, 29,000; Yasawa Group, 4,000; Viti Levu, 81,500; Kandavu, 10,000; Central Fiji, 8,000; and the Eastern Group, 8,000. The ruined and deserted villages throughout the country testify to their disappearance. Among them there is some variety of race, and there are many Tonga islanders resident on various islands.

The troubles in New Zealand sent many British settlers and their families here, so that while there were 831 white people in the Archipelago in 1867, they numbered 1,288 in 1868, with 164 Americans. In 1870 Mr. Consul Marsh estimated that the Europeans amounted to about 4,000. By the census of 1881 the total population amounted to 124,999, including 2,293 Europeans; the natives numbered 115,635, the remainder consisting of half-castes, imported Polynesian labourers, &c.*

* Accounts of this interesting archipelago will be found in the Journal of the Royal Geographical Society, vols. xxvii and xxxii; Correspondence on the Fiji Islands, Parliamentary paper, May, 1862; the Flora of Fiji, by Dr. Berthold Seemann, 1862; Viti, an account of a government mission, &c., by Dr. B. Seemann, 1862, &c.; "Fiji in 1870," by

The Climate of the Fiji group is well adapted to all the tribes of tropical plants, and to not a few of those of the temperate zone in the more mountainous portions of the islands. The temperature averages from about 84° F. in February to 74° in July. The barometer during the fine months, April to November, stands at about 30.1, seldom moving more than three-tenths of an inch, and showing highest for E.S.E. winds, and lowest for those from the N.W. At the approach of, and during a cyclone, however, the barometer has been known to fall two inches.

The climate of the islands, as is not unusual within the tropics, is very different on the opposite sides of the various islands. From the constant prevalence of the wind in one direction, the windward sides of the islands are refreshed by showers, and the result of this is that the weather side exhibits the tropical and luxuriant vegetation which is so remarkable in this group. The lee sides of the islands, on the contrary, have a burnt and barren appearance from the want of the moisture brought by the atmosphere. The difference in temperature, however, is not great. The greatest amount of rain falls in February and March. Dysentery is the disease most feared by Europeans.

The Winds, from April to November, prevail from the E.N.E. to S.E. quarters, at times blowing a fresh trade wind. From November till April, northerly winds are often experienced, and in the months of February and March heavy gales are frequent. They usually begin at N.E., and pass round to the North and N.W., from which quarters they blow with the most violence; then hauling to the Westward they moderate. They generally last two or three days.

The wind blows strongest and with most persistence from S.E. by E. and E.S.E., but around the islands of Viti Levu, Vanua Levu, and Taviuni the direction of the wind is much altered by the trend of the coast, the height of the mountains, and the effect of the land and sea breezes, which are, in many parts of the coast, clearly apparent. The south-easterly wind is strongest in the months of August to October, when it rises occasionally to the force of a moderate gale; and is most feeble in December to March, when, after a short period of calms, or light winds with westing in them, the "trade" sometimes returns in a smart squall from S.S.W. or South and quickly veering. A sudden rise of one-tenth of an inch in the barometer, with lightning to the southward, indicates the approach of a change of this description.

From December to March, too, is the hurricane season, and these storms, are sometimes attended by a storm wave, which has been known to rise as much as 10 ft. above the ordinary sea level, inundating the low islands and

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H. Britton, a small work published in Melbourne; "Ten Months in Fiji," by Colonel W. J. Smythe, London, 1874; "Notes of Travel in Fiji and New Caledonia," by J. W. Anderson, 1880; "A Year in Fiji," by J. Horne, 1881; "The Coral Lands of the Pacific," by H. S. Cooper, 1882; and "Wanderings, South and East," by W. Coote, 1882.

R.H. Laurie 35, Minories, London.

districts exposed to its force, and spreading devastation in its path. These storms are cyclonic and occur on an average once a year. They are most severely felt at the extreme West of the group.*

The Tides throughout the group appear to be very irregular, until they are closely studied. The flood sets in opposite directions on the eastern and western sides of the group. Thus, on the South side of Vanua-Levu it flows from the East as far as Buia Point, where it is met by the flood coming from the West. On the South coast of Viti Levu, the flood sets to the S.E., and the ebb to the N.W. It is high water at Ovalau at 6^h 10^m, full and change. At Muthuata, 5^h 30^m. The greatest rise and fall of the tide is 6 ft. The currents set strongly in and out of the passages, until the water rises above the level of the reefs, when it flows over in all directions, and its force is much decreased.

The Current seems to set here in a contrary direction from what might at first be assumed. It is remarkable that during the examination of the S.E. islands of the Fiji group, in all the trials of the current, the American surveyors found it setting to the *eastward* about half a mile an hour, varying in direction from E.N.E. to E.S.E. This fact is confirmed by the information obtained from the natives, that canoes which are wrecked to westward are always drifted upon these islands. From the later examinations it is found that there is no regularity of the current among these islands, at times a westerly set and at others an easterly set prevailing, the latter predominating.

Earthquakes are not unfrequent; according to the white residents, they generally occur in the month of February. Several shocks are often felt in a single night. The only place where there are any signs of volcanic heat is Savu-Savu, on the South side of Vanua Levu; but several islands in the group exhibit signs of craters. One of these is at the West end of Kandavu. There are others at Nairai, Goro, and in the Ringgold Isles. The peaks, however, are usually basaltic cones or needles, some of which rise to the height of several thousand feet, and no running stream of lava has been seen occurring on any of the islands. Conglomerate, tufa, and compact and scoriaceous basalts, are found of every texture and colour, and in every state of decomposition, When decomposed, they afford a rich soil, which, clothed with a very luxuriant foliage, covers the islands to their very tops, clinging to every point where it is possible for a plant to take root. This rich vegetation gives a degree of beauty to the aspect of the whole group.

In the vicinity of this group patches of scum or confervæ are sometimes met with, which are likely to be mistaken for reefs. H.M.S. *Alert*, 1881, was

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* For an interesting paper by R. L. Holmes, Esq., on the Climate of Fiji, resulting from observations extending over 10 years, 1871-1880, see the "Quarterly Journal of the Meteorological Society," London, vol. vii, 1881, pp, 222-241.

twice suddenly hove-to on account of this appearance, but on examination, what appeared to be a reef awash was found to consist of patches of confervæ floating on the surface of the sea.

The positions of the islands of the Fiji group, according to Wilkes's survey, depend upon the meridian of Observatory Point (on which he erected a pile of stones as a mark to the harbour) of Levuka Harbour in Ovalau. This, from moon culminating stars, is in long. 178° 52′ 40·78″ E., and the lat., from circum-meridian observations of sun and stars, is 17° 40° 46·79″ S. Capt. Denham, R.N., makes the school-house at Levuka in long. 178° 49′ 45″ E., or 2′ 54″ West of the former. Later observations, however, place this spot in lat. 17° 40′ 45″ S., long. 178° 51′ E. As the line of long. 180° passes through the group, to avoid inconvenience the time of the Fiji group is taken as the mean time of Levuka.

Vatoa, or Turtle Island, at the S.E. extreme of the group, was discovered by Cook in 1773. In itself it is unimportant, except in its position, as being the weathermost of the archipelago, and its low and dangerous character.

A singular mistake crept into the survey by the United States' Expedition. On May 5, 1840, the *Vincennes* "had a sight of Turtle Island, and determined it to be in lat. 19° 48′ S., long. 178° 33′ W. It has the appearance of a small rounded knoll." This would seem to be circumstantial, and is further confirmed by a foot-note on the same page. In a subsequent passage (vol. iii. p. 379) the United States' ship *Porpoise* is said to have determined it to be in lat. 19° 50′ S., long. 178° 37′ 45″ W. "It was found to be 3 miles long, by 1¼ mile wide. The reef extends all around the island, and is from 1½ to 2 miles wide."

This singular variation in longitude from that assigned to it by the great discoverer Cook (178° 0′ W.), or 37′ in error, is startling, because the accuracy of Cook in this instance had been confirmed by other navigators. The following by Capt. Worth, R.N., H.M.S. *Calypso*, may explain it:—

"I had procured from the master of the whale-ship at Apia Capt. Wilkes's (of the American Exploring Expedition) works, with his charts and plans of the Fiji Islands, in which it stated that Turtle Island had been surveyed, and the reef (on which an American whale-ship had been lost) examined. I cannot, however, conceive this to be the case, or if so, some great error must exist in the publication, for not only is there no mention made of the detached and dangerous reef, but the position of the island itself is placed very erroneously, and which it is the more necessary to correct from its being the S.E. point of this intricate group, and which vessels from the eastward would usually round in entering it. We made the centre of the island to be in lat. 19° 47′ S., and long. 178° 8′ W., 29 miles to the eastward of Wilkes, who places it in lat. 19° 50′ S., long. 178° 37′ W."

From later observations the position of the hummock on its N.E. end is given as lat. 19° 49′ 11″ S., long. 178° 12′ 46″ W.

Vatoa is a low narrow strip of coral structure, densely wooded, 2 miles long by half a mile wide, rising gradually at the N.N.E. part to an elevation of 209 ft.; but with the surrounding reef it may be considered as occupying a space equal to 4 miles N.E. by N. and S.W. by S., by $1\frac{3}{4}$ mile wide. There is a boat passage through the surrounding reef into an excellent harbour on its N.W. side, which may be found by bringing the northern extreme of the island to bear S.E. In 1880 the population consisted of 90 Fijians. There are some springs of fresh water on the West side of the island.

A detached reef, *Vuata-Vatoa*, $2\frac{3}{4}$ miles in extent North and South, and 2 miles East and West, with a tidal basin of deep water, lies about 3 miles S.S.W. from the S.W. extremity of Vatoa; the passage between being 3 miles in width, and clear of danger. The current sets to the north-westward upon the reef side of the passage, and south-eastward on the island side.

Anchorage of a temporary nature, in S.E. winds, may be found near the barrier reef of Vatoa, in 13 fathoms, sand and shells, with the outer part of the Three Sisters Rocks bearing S.W. $\frac{1}{2}$ S.; the North point of Vatoa S.E.; and its West point S. by W. $\frac{1}{2}$ W.—*Nav.-Lieut. Wonham*, H.M.S. *Barracouta*, 1875.

It is high water, on full and change, at Vatoa Island, at $6^h\ 11^m$, with a rise of 4 feet.

Ongea.—The S.E. island of the main group is called Ong-Hea, or *Ongea*. There are, in fact, two islands enclosed by the same reef, called Ongea Levu and Ongea-Ndriki, about 300 ft. high, the former being densely wooded. There is a good entrance on the western side of this reef, and a harbour, with fair anchorage in 4 to 11 fathoms, to which the name of *Port Refuge* was given by Wilkes, but there is little or no inducement to enter it, for the islands are barren, and no water is to be found. In 1875 H.M.S. *Barracouta* entered by a channel to which her name is given, 250 yards wide, with 13 fathoms in mid-channel, found by bringing the most northerly of the rocks off the North shore of Ongea-Ndriki to bear E. $\frac{1}{2}$ S., the vessel being conned from the mast-head. There are about 80 wretched inhabitants at a village on Ongea-Levu, the northernmost.

At $3\frac{1}{4}$ miles E. by S. of Ongea-Ndriki is a dangerous reef and sand-bank, called *Nugu Ongea*, about 2 miles in extent.

Fulanga, *Boulang-Ha*, or *Laquaba* (of Arrowsmith), lies 6 miles to the West of Ongea. It is a fine island, composed of volcanic materials, *Quoin Hill*, at its northern end, being 260 ft. high; this is one of the group on which fine timber grows, and is resorted to by the Vavao and Friendly Islanders for building their canoes. It is surrounded by the usual coral reef, and contains a central coral basin, the entrance to which is on the N.E. side, through the reef, suitable for small vessels. The tide rushes strongly in and out of this basin. There are many islets and reefs in the basin, composed of scoriaceous volcanic materials, and these afford some biche-de-mer. There is a

village at the head of the bay, and another on the S.E. part of the island, accessible only by canoes. Good water, fruit, vegetables, and poultry, can be obtained; the beach abounds with very good oysters. The natives are about 260 in number, the chief village being *Monothake*, on the South coast.

Moramba is a small uninhabited island, 160 ft. high, and half a mile in diameter, 15 miles W.N.W. of Fulanga. It is well wooded, and surrounded by a reef, but useless to vessels.

Kambara (the *Appallo* of former charts) is 6 miles West of Moramba. It is of an oval form, 4½ miles long North and South, by 3 miles wide, and is the westernmost of the eastern group. It is fertile and well wooded; its timber is esteemed above that of all other islands of the group for canoe building, and cocoa-nut groves abound along its shores. This island may be known by a remarkable bell-shaped peak on its N.W. side, which is a good landmark; it is covered with verdure, and is 470 ft. high, with a clump of palms on its summit. The island is surrounded by a reef, which almost disappears on the N.W. side, North of the highest hill, admitting of good anchorage in 12 fathoms, sand and coral, protected from winds from N.E., through East and South, to S.S.W., with the clump of palms on the summit bearing S. by E., and 1½ cable from the sandy beach, on which boats may land with care. The principal village is *Tokalau*, opposite the anchorage. The total number of inhabitants is 290. Vegetables can be obtained, but there are no facilities for watering.

Wangava, *Enkaba*, or *Foocaffa*, lies 2½ miles N.N.E. of the foregoing. It is 3¼ miles long N.E. and S.W. by 1 mile wide, and 150 ft. high, well wooded, and has a breach in the reef on its N.W. side, but no harbour. The natives of Kambara come here for fish and cocoa-nuts.

Tavunasithi, *Tabune-Siki*, or *Tubanaielli*, is a small uninhabited island, 200 ft. high, 13 miles N.W. by W. ½ W. of Wangava, and surrounded by a reef.

Between the Kambara range of islands and those to the eastward is the *Fulanga Channel*, which appears to be clear.

Vanua Vatu, 23 miles N.W. by N. of Tavunasithi, is about 3 miles in diameter, N.W. and S.E., surrounded by a coral barrier which joins the shore in several places, and encloses a small lagoon full of rocks. The summit is crater-shaped, densely wooded, and 310 ft. above the sea. Boats can cross the reef at half-tide in the bight East of the northern horn, and there is a fair boat passage at high water on the West side of the horn opposite a sandy spit of the island. Small craft are said to anchor here close to the reef in East winds, but it is not recommended. There is one village containing about 100 inhabitants, who are badly off for food and water.

Yangasa, or *Angasa*, 10 miles N.N.W. of Ongea, the Table Island of Wilson, is easily distinguished, and is remarkable for long, regular ridges that extend through the centre, and appear as if artificially formed. The island, with three smaller ones, varying from 210 to 390 ft. high, is enclosed in one

extensive reef along with several small islets. The two westernmost islets are visited by the natives of Mothe for cocoa-nuts. To the eastward and northward of Ongea and Yangasa are several detached reefs, extending 7½ miles off the latter, on one of which is *Naiabo Islet*, 40 ft. high.

Namuka, the *Neat's Tongue* of Wilson, its discoverer, lies 6 miles N.W. by W. of the westernmost of the Yangasa group. It is 4 miles long and 1 mile broad, its summit being 260 ft. high, over-looking the North coast. A coral reef nearly surrounds the island, but opens out on the N.W. side, forming a harbour available for small vessels, with fair anchorage in from 7 to 13 fathoms, sand and coral. The entrance is between the coral patches, but vessels drawing over 14 ft. should not enter, as there are sunken coral heads between the patches. By bringing the highest hill to bear S.E. by E. a channel may be chosen where the space between the coral patches (awash) is over 100 yards. A good light is necessary. At 3½ miles N.E. ½ E. of the entrance to the harbour is Wilkes Reef, dry at low water. The village is in a picturesque, sandy bay, on the South coast, and contains 127 inhabitants.

Komo Harbour.—At 9 miles N. by W. of Namuka are two small islands, *Komo-Levu* and *Komo-Ndriki*, enclosed in the same reef, through which there is a passage on the North side, leading to a good anchorage, in 6 to 10 fathoms, for vessels of large size, easily entered and left. There are two passages to it, either of which is available for steam vessels, but sailing vessels of over 200 tons should choose the West passage, where there is room for working. A good light and favourable tide is necessary for either. The East passage was used by H.M.S. *Barracouta* in 1875, but has two coral heads in it, the most southerly awash at low water, nearly in mid-channel, leaving a channel of only 140 yards between it and the East inner horn of the reef. The East passage is to be found by bringing the clump of palms on the summit of Komo, 270 ft. high, to bear S.S.E.

The West passage is 550 yards broad. The rocks which form its East side are sunken, and seldom break; from this passage the cocoa-nut clump on the summit of Komo bears S.E. by E. Anchorage of a temporary nature can be obtained outside the barrier reef, on the North side, in southerly winds. A boat passage, which can be made use of in almost any weather, is to be found by bringing the cocoa-nut clump on the summit to bear S.W. by W. Boats can approach the village at all times of tide; it is on the S.E. side of the island, and has about 100 inhabitants.

At 1¼ mile westward of the N.W. end of Komo Reef is *Thakau Vuite Reef*, 2¾ miles long, by 2 miles broad, with a sand kay near its N.E. end. At 1½ mile N.W. of this reef is *Olorua*, or *Olenea*, a small, desolate island, 250 ft. high, encompassed with an extensive reef; it was first seen by Wilson.

Mothe, or *Mozé*, lies 6 miles E.N.E. of Komo. It is one of the most picturesque islands of the group, with an undulating surface; its hills are more free from wood than those to the southward, and its central peak rises to

590 ft. high. It is 2¼ miles in diameter, and is surrounded by an extensive reef, through which there is a boat passage on the East side, between Mothe and Karoni, and boats can pass over the barrier on the N.W. side at half-tide. Anchorage can be obtained outside the reef on the N.W. side of the island, opposite the village of Natambua, protected from East through South to S.W. in 12 fathoms, sand, with the summit bearing S.E. by E. ½ E. There are 187 inhabitants; the principal village being Nassau, on the South coast. Water is plentiful, but not easily shipped. Bread-fruit, &c., can be had in abundance. *Karoni*, which is Wilson's *Skerries*, is of small size, 120 ft. high, and lies within the same reef, 3½ miles S.E. by S. of the summit of Mothe, and 5 miles W.N.W. of the extremity of the reef.

Mothe forms the South side of what Wilkes terms the *Oneata Channel;* it is a good landmark to run for in making the group, being high and surrounded with sloping sides. Its soil is rich, and its population a few natives. There are three detached reefs lying to the northward and E.N.E. of it, the easternmost being 11 miles distant.

Oneata was seen by Wilson, and lies 11½ miles North of Mothe; it forms the northern side of the Oneata Channel. It is 2½ miles long N.E. by E. and S.W. by W., its summit being 160 ft. high, and may readily be known by Loa or Observatory Isle, 6 cables to the N.E., 140 ft. in height. The reef around Oneata is also extensive, stretching 5½ miles E. ½ N. of Loa; it has three good entrances on the N.W. side, and one on the North, to the spacious lagoon.

Broken Passage is 8 cables across, with three patches in it; from the best channel the summit of Loa bears S.W. *Middle Passage* is 2½ cables wide, and has 13 fathoms, sand and coral, in the centre. It is found by bringing the summit of Loa to bear E.S.E. A very small coral head, with 2 ft. on it, lies on this bearing, 2 cables inside the centre of the passage. *Schooner Passage*, W. by N. of Loa, is not well defined. *Transit Passage* is 2 cables wide, and has 6 fathoms in the centre; the right extreme of the hill on Loa, in line with the North point of Oneata, bearing East, leads to it, but must not be carried through, as the end of a spit of rocks connected with the North side of the passage lies on the bearing; H.M.S. *Barracouta* entered by this passage in 1875.

There is excellent anchorage under *Observatory Isle*, near a settlement on the N.E. side of the island. A second anchorage is to be found off the West side of the island, near a large sandy bay; but Capt. Bethune says that he tried the anchorage at Oneata, and found it unsafe for 17 ft. No water is to be had here; but fruit, vegetables, and poultry may be obtained. The natives are sharp traders. The population is 155, including two Europeans. The village is on the South side of the island, in a grove of cocoa-nut trees, much troubled with mosquitoes. The southern side of the island is a mass of lava but little decomposed.

Between Oneata and Laguemba are the two *Echouas*, or *Aiwa Islets*, about 200 ft. high, and covered with bushes. They are both uninhabited, and are surrounded by an extensive reef 19 miles in length, with the exception of a large opening on the North side, N.N.W. of the islets, which affords anchorage, exposed however to N.E. winds.

LAKEMBA, or *Laguemba* (D'Urville says, improperly, *Atakimbo*), is the largest island of the Lau, or Eastern group. Its form is nearly round, 4 to 5½ miles in diameter, with an extensive encircling reef. The principal village is on the South side, and contains two-thirds of the population (972 in 1879) of the island. The highest peak of Laguemba is *Mount Goodenough*, 720 ft. high. This is one of the principal Wesleyan Mission Stations, being the first island in the Fiji group which was Christianized by English missionaries, in 1835.

The reef extends 6½ miles from the island in an E.N.E. direction, enclosing a lagoon ; in it there are two openings, one on the S.E. side sufficient for large vessels, but dangerous from the coral patches which stud it, found by bringing the East extreme of the island to bear W. by N. ½ N., and one opposite to the the village of Toumbo on the South or S.W. side. Into the latter a vessel of 100 or 200 tons may enter ; but after getting in the space is very confined, and it would be necessary to moor head and stern.

Laguemba, like the rest of this group, is of volcanic formation. The soil is similar to that of Vanua, composed of a dark-red loam. The low ground abounds in kumalas and yams. Good water may be got at Wankatelatha, near the anchorage in 10 fathoms.

Argo Reef.—To the eastward of Lakemba is the great Argo Reef, consisting principally of barrier reefs, about 80 miles in circumference, enclosing two lagoons with a depth of 8 to 40 fathoms, sand and coral, among the numerous enclosed dangers. Its native name is *Bukatatanoa*, and it is one of the most extensive and dangerous in the group. Its English name is derived from the loss of the English brig *Argo*, on its S.E. end, in the year 1806. Besides this, another vessel, named the *Harriet*, is said to have been lost here. All hands from one of these vessels were killed, while only a few escaped from the other.* In 1878 a large number of copper bolts were found here, supposed to have belonged to these vessels. At 2½ miles southward of the North end of the reefs are *Vanua Masi* and *Bacon Islets*, 1¼ mile apart, and 80 ft. and 60 ft. high respectively.

Reid Reef, 20 miles in circumference, lies 4½ miles to the N.E. of the North end of Argo Reefs, and encloses a lagoon which has three islets in it, with a

* The following note was necessary in former years:—"It must be borne in mind that any canoe or vessel, whether native or foreign, when driven on shore, is accounted an offering to the gods. All that it contains is considered as belonging to the chief of the district where the incident happens, and the people on board are at once sacrificed."

depth of 20 fathoms near the centre. This lagoon has been called Reid Haven. The best entrance for ships is to be found by bringing Late i Viti Islet to bear N.E. by E., and conning from the mast-head with a favourable light. *Malan Bank*, of 8 fathoms sand and coral, lies S.E. 1 mile from the S.E. horn of Reid Reef.

Naiau, *Neaou*, or *Oedida*, is a high island, 16 miles N.W. by W. of Lakemba, and rises in perpendicular cliffs from the sea to the height of 275 ft.; it is thickly wooded, 3½ miles long by 2 miles broad, and is from 530 to 580 ft. high. It has only a small reef attached to it, the N.W. side being nearly free. It offers no facilities for the visits of vessels, but contains a population of 230 inhabitants, distributed among three villages. At 7 miles N.E. ½ N. from the boat passage off Ndevo village, on the East side of the island, is *Maafu Rock*, a dangerous rock of 3 fathoms, seldom breaking, lying on the N.W. edge of a bank of coral and sand, hardly a cable in extent.

Tuvutha, or *Tabutha*, 21 miles N.E. by N. ½ N. from Naiau, is a densely wooded coral island, 3 miles long; near its N.W. end is a remarkable peak, 800 ft. high. A barrier reef surrounds the island, and small vessels may anchor in 7 to 14 fathoms, close to it, about 1 mile South of the village, sheltered from winds between S.E. and N.W., through East. The village, which contains 70 inhabitants, is on the S.W. coast, and at 1¼ mile N.W. of it is a good boat passage through the reef. Food is scarce, but good water can be obtained.

At 2 miles S.S.W. of the anchorage is *Tavunuku-i-wai*, a reef 7 to 9 cables in diameter, 1½ mile S.E. of which is *Tavunuku-i-vanua*, or *Smith Reef*, about half a mile in diameter, with a small sand kay on it.*

At 8¾ miles E. ½ S. of the South end of Tuvutha lies the small sand island of *Yarona*, covered with trees, and surrounded by a fringing reef. It is only inhabited during the turtle season, which begins in October and ends in February. Landing is bad, and there is no anchorage. It has three reefs in its neighbourhood, one, *Thakau*, *Tambu*, or *Gordon Reef*, lying N.E. 6½ miles; another, *Thakau Nokwa*, E. by S. 1½ mile; the third, *Thakau Lasemarawa*, or *Hawkins Reef*, South 2½ miles.

In S.E. winds small vessels can anchor off the N.W. side of Gordon Reef, with the summit of Munia just open to the East of the North hump of Katafanga; and in 9 fathoms, on the N.W. side of Hawkins Reef.

Thithia, *Chichia*, *Dzizia*, or *Favourite Island*, lies 17 miles N.W. by W. of Naiau. It is volcanic, nearly circular, about 3½ miles in diameter, and a shore reef extends around it, with no opening but for canoes. Its highest part, at the N.W. end, is 540 ft. high. It is thinly wooded, and has about 550 inhabitants, 150 of whom are foreign labourers, employed by two Europeans in

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* Between Tuvutha and Thithia, sunken rocks with 2 fathoms over them have been doubtfully reported to be in lat. 17° 49½′ S, long. 179° 2½′ W.

cultivating cotton, about 120 tons of which are produced annually. The soil is rich, and everything is produced in abundance; good water is plentiful. Extensive cocoa-nut groves clothe its low points. Small vessels can anchor, in winds from South to East, in a bight of the reef on the N.W. of the island, opposite Torokua village, or temporarily opposite a plantation 1 mile further South. There is good landing on the N.W. coast. At 2¼ miles S.W. of Thithia is *Thakau Nawa*, or *Kneass Reef*, 1 mile in length.

Mango is another small island, 3 miles in diameter, 17 miles N. by E. ½ E. of Dzizia, its greatest elevation being 670 ft. It is remarkable for an open space near its centre, which appears as if it had been artificially cleared. It is surrounded by a reef, which has a break on the North side, where there is merely a narrow fringe, and a ledge of sand and coral, suitable for anchorage in winds from S.W. through South to East. In this break a buoy has been moored in 14 fathoms, sand and coral, to which vessels of 200 tons may secure. Landing is good at the pier, except in strong North winds. The anchorage is not safe in summer, and sailing vessels should put to sea when the wind veers to N.E. It is high water, on full and change, at Mango pier, at $6^h\ 10^m$; springs rise 4⅔ ft.; neaps range 3 feet. The southern part of the reef extends off about a mile, and has three small islets on it.

The island is the property of English colonists, and in 1878, 400 tons of cotton were produced. Coffee, limes, oranges, pine-apples, kumulas, yams, and bread-fruit are grown, and copra is exported. A fine breed of Angora goats has been imported. There are no natives on the island; foreign labour is employed.

Frost Reef, dry at low water springs, lies W. by S. 7½ miles from Mango pier; it is nearly 1 mile in diameter, with rock 2 ft. above high water near its northern edge. Vessels bound from Mango to Levuka should keep the right extreme of Munia in line with the left extreme of Mango E. by N. ¾ N., until they have cleared this reef.

Vekai, 5½ miles northward of Tuvutha, is a low islet, 30 ft. high, covered with scrub, on the East side of a circular reef, 2 miles in diameter, and is resorted to during the turtle season. The boat entrance is on the N.W. side of the reef.

Katafanga, 6 miles N.E. by E. from Vekai, is also a small isle, 180 ft. high. Its reef is much more extensive, being 3½ miles East and West, and has a small opening near the N.E. end of the island, which admits vessels drawing 10 ft., but it is impeded by some dangerous coral knolls. There are huts on its S.E. side, and good water, with abundance of sugar-cane, fruit, and vegetables, may be procured. This island is the property of a European, who cultivates cotton and copra, with the aid of foreign labour. Both the last-named islands are volcanic.

Malevuvu Reef, 5 miles N. by E. ¼ E. from Katafanga, is 2½ miles long, N. by W. and S. by E., and is awash, with the sea breaking over it.

EXPLORING ISLES.—The group called the *Exploring Islands* by the American Expedition would be better named *Wilson Islands*, from their discoverer, Capt. Wilson, in the *Duff*, September 12th, 1797. They are very well laid down in this chart, but not the slightest notice is taken of his claim by the American officers. They lie to the northward of the foregoing. The islands, seven in number, are all of considerable size. Each island has its own separate reef around its shore, and the whole are enclosed within a barrier reef, 77 miles in circumference, with many passages through it. It has several peaks, the highest of which, in the centre of the island, is 930 ft. high. The southern half of Vanua Mbalavu is chiefly volcanic, and the soil very fertile, but the N.W. part is formed of coral covered with impenetrable bush. The population in 1878 amounted to about 1,203, including 23 whites.

VANUA MBALAVU, or *Sir Charles Middleton Island*, the largest of them, is of a serpentine shape, and 14 miles in length, but in no place more than 2½ miles in width; it is situated along the western side of the barrier reef, and contains many fine bays and safe anchorages. This is one of the few barrier reefs in Fiji which have a sloping outer edge to windward, with a bank of soundings, on which, in case of necessity, a vessel might anchor. The other islands are called by the natives *Munia*, *Susui*, *Malatta*, *Thikombia*, *and Sovu*.

Munia, or *Hadow Island*, is the southernmost of the group, and is 2¼ miles in length. The anchorage of the U.S. vessel *Porpoise*, named *Discovery Harbour*, is described as a good one, in 8½ fathoms, fine sand. The highest peak of Munia, called *Telanicolo*, is 950 ft. high; it is composed of volcanic masses, with high, craggy, overhanging cliffs. The island is owned by an American, who employs foreign labour, and the settlement is on the western side, where water and a few vegetables may be obtained. Landing is not easy.

Thikombia, or *Ticumbia*, *Van Shirnding Island* of Wilson, densely wooded, lies 6 miles N.E. ½ N. of Munia, to which it bears a close resemblance, but is much smaller. It appears from seaward to be flat-topped, with several notches, and is 550 ft. high. It has about 50 inhabitants in a village on the South side, and affords but little water. Landing is good at the village.

Susui, or *D. Scot's Island*, lies 3 miles W. by N. of Munia, and is used as a grazing ground for cattle. It is divided into three parts, of which the easternmost is low, and covered with thick shrubbery and groves of cocoa-nut trees; the western portion rises in broken basaltic peaks, 430 ft. high, and is thickly wooded. The inhabitants number about 50. Good water may be obtained on the N.W. side, running from the cliff. On this side, also, is a beautiful harbour, secure from all winds, whence an extensive valley runs back, thickly covered with bananas, cocoa-nuts, &c., with a small stream running through it. Inland, fossil shells were lying about in every direction, and were seen exposed in the strata on the hill sides. Sugar-cane was growing in

great perfection. The southern side of the island is in close proximity to the reef that surrounds the cluster.

Malatta is the next island to Susui; it is much smaller, 430 ft. high, and separated by a narrow passage from Susui and Vanua Mbalavu; boats can pass through the latter channel at half tide.

Avea, or *Curling Island*, is a small island, 610 ft. high, off the N.E. end of Vanua Mbalavu. It has about 40 natives residing in a village on the S.W. point. At 4 miles E.N.E. of it is a small cluster called *Sovu*, *Osubu*, or the *Three Brothers;* the western and highest one rises to 230 ft. high.

The Lagoon.—The passages most frequently used into the Exploring Isles Lagoon are the Tongan Pass, on the S.E. side of the barrier reef; the American passage, on the eastern side; and the Ngillangillah Passage at the N.W. corner of the lagoon, and close to the island of the same name.

Tongan Pass is that most frequently used for entering. It is situated about midway between Thikombia and Munia, is three-quarters of a mile broad, and has a coral patch 250 yards in diameter, and awash at low water, in the centre. Running into the lagoon with the prevailing wind, this channel is easily navigated, provided the light is favourable. The tides are irregular. The summit of Avea bearing N.W. ½ N. will lead to this pass; continue this course for 1¾ mile inside the lagoon until the bearing of Yanuyanu (which appears as a point of the main island standing out in relief) bears W. ½ S., when steer for Lomaloma and enter the harbour, to the North of Yanuyanu. These directions are intended as a guide for steering on a track the least strewn with reefs, but, from the nature of the ground, this cannot be exactly followed, and the course of the vessel must be occasionally altered to avoid the numerous coral heads. Unless the light is favourable and the look-out vigilant, the navigation of this lagoon is hazardous. It is seldom safe to steer to the westward in it after 2 p.m.

American Passage bears East 5 miles from the Sovu islets. It has the advantage of being easily navigated with the prevailing wind either in or out. It is three-quarters of a mile broad, and the depth in the centre is 106 fathoms. On a clear day Koro Mbasanga bearing W.S.W. will lead to the passage.

Nuku Thikombia Reef, 3½ miles long N.N.E. and S.S.W., lies 4 miles S.E. of the American Passage, and protects it to some extent from the south-easterly swell. On its S.W. end is a sand kay 200 yards in diameter, upon which there is a cairn of stones 8 ft. above high water.

Ngillangillah Passage is useful for steam vessels bound between Levuka and Lomaloma. There are many coral heads outside it, through which a course can be steered without difficulty, provided the light is favourable. The narrowest part of the passage is 300 yards wide. The tides run strong through it, but with regularity. The track to Lomaloma leads round the North coast of Vanu Mbalavu, which is fronted by numerous coral heads. Off Blackswan

Point the distance from the barrier reef to the shore is only 300 yards, and there is a coral patch in the centre of the channel; the shore should be kept close on board.

Besides the three passages described, there are others which are less frequented, but which are available for vessels of large size, viz., the three Sovu Passages, North and N.W. of Sovu Islets, and the Andiwathe Passage, only useful for small vessels, West of Vanua Mbalavu. Large sailing vessels bound from Lomaloma to Levuka or Suva would find one of the Sovu Passages an easier means of exit from the lagoon than beating through the Tongan Pass, or navigating the North side of Vanua Mbalavu with an afternoon sun.

Lomaloma is the chief town of Vanua Mbalavu and the principal depôt for produce in Lau, or the Eastern group. It is near the South end of the island, on the eastern coast, and behind the small wooded island of *Yanuyanu*, which is 260 ft. high. Lomaloma is chiefly composed of native houses but there are a few European stores and residences, a court house, and a spacious native church.

Between Yanuyanu and the town is a small well-protected harbour, where good anchorage can be obtained by a large vessel in 7 fathoms, sand and mud. Vessels of over 200 tons have to warp out as there is a long spit of coral grit running out West of Yanuyanu, which narrows the space for tacking; it is most convenient to enter North of the island. The beach is well adapted for hauling up small vessels. Yams, eggs, turkeys, fowls, milk, and bread can occasionally be obtained from the European residents, also water.

Kanathea, or *Kanazea*, 7½ miles to the West of Vanua Mbalavu, with its many verdant and fertile hills, is a remarkably pretty island. It is the *Sim Island* of Wilson's chart, and is 2 to 2½ miles in diameter. Its central peak is sharp and lofty, 830 ft. high, somewhat resembling a look-out house, formed of basaltic columns. It is surrounded by a reef, and has on the North side a small indentation in the shore reef, about 130 yards broad, in which small craft can anchor near the beach. At 1⅔ mile N.E. by N. ½ N. from this harbour is *Boehm Rock*, a coral patch awash at low water, and about a cable in diameter. The reef extends 6 miles N.E. by N. of Kanathea, and to within about a mile of that of Vanua Mbalavu, enclosing a lagoon. The passage between them should not be attempted by night, and during the day only when the sun is high, as the sea is generally smooth on the reefs under the lee of Vanua Mbalavu. H.M.S. *Pearl*, in 1874, passed through this channel, when Kanathea Reef was only marked by a ripple, whilst the sea was smooth on the reef extending from the N.W. end of Vanua Mbalavu. Boats can usually cross the S.E. side of the reef at half tide by bringing the northernmost house on the beach just open southward of a remarkable thumb peak, W. ½ N. Kanathea is the property of two Europeans, who cultivate cotton and copra.

Morse Reef lies 1½ mile to the S.E. of Kanathea, and half a mile S.S.E. of

the South elbow of the barrier reef. It is of very small extent, and breaks heavily in moderate weather.

Malima Islets, the *Scars* of Wilson, are two small uninhabited islands 7½ miles N.N.W. of Kanathea, situated in the centre of a lagoon, which is 1½ to 2 miles in diameter, and protected by a barrier reef awash at low water, except at certain places on the North side, where boats can cross at any time of tide. The southern and largest islet has a conspicuous lump 130 ft. high.

Vatu Vara, *Vatu-rera*, *Batou-bara*, or *Hat Island*, lies 19½ miles W. ½ S. of Mango. It is 1¼ mile in diameter densely wooded, and its centre is surmounted by a very high peak of a singular structure, and as even as a table on its summit. This islet, which may be seen a long way off in all directions, is the mark in this part of the Fiji Archipelago. It is about 1,000 ft. high, and was seen from the *Pearl's* deck well above the horizon when 30 miles distant. At about 20 miles distant, the lower land beginning to be visible, causes the island to assume the shape of a hat. The fringing reef extends about a mile off the West side of Hat Island, but disappears off its South side. An American owns this island. Boats can land with difficulty at high water on the North side.

Nukutolo, or *Nugatobe Islets*, or Nougo-tolou (the "Three Sands" of D'Urville), are three in number, small, 40 to 100 ft. high, and covered with trees; the two westernmost are enclosed in the same reef. They lie 4 miles S.W. by W. ½ W. from Yathata, the natives of which visit them occasionally for turtle and cocoa-nuts.

Yathata, *Yeata*, *Azata*, or *Cap Island*, is a high island, with a densely wooded bell-shaped peak, 840 ft. high, lying 9 miles N. ¾ W. of Vatu Vara; it is surrounded by a coral reef, and is 2½ miles long by 1½ mile wide. On its North side is a good boat passage, but no anchorage. At 5½ cables E.N.E. of Yathata, with a small sand islet covered with cocoa-nuts between, is *Kaimbu Island*, 1½ mile long, 150 ft. high, partially cultivated, and connected with Yathata by the reef. Yathata has extensive cocoa-nut groves along its shores; it is one of the islands that form the southern boundary of the Nanuku Passage. It has about 50 inhabitants, including two white settlers, living in a village on the East coast. The water is bad, and there are no supplies.

Naitamba, *Neïta-Oumba*, or *Direction Island*, is 18 miles N.E. by N. of Yathata, and is 610 ft. high and rugged; it is 2 miles in length. The barrier reef does not extend beyond three-quarters of a mile from it. It is owned by two Europeans, who grow cotton; the settlement is on the West side, and vessels drawing 5 ft. may enter between the rocks off it at high water, in easterly winds. Good water may be obtained here.

Kimbombo, or *Okimbo*, 13 miles East of Naitamba, and 6 miles North of the N.W. point of Vanua Mbalavu, is made up of three small islets, 100 to 190 ft. high, enclosed in the same reef, 5 miles East and West, by 2 miles in its greatest breadth, with an entrance on its N.W. side. The islets are wooded.

and have some cocoa-nut trees; turtles are taken in the season, and some biche-de-mer. At $2\frac{3}{4}$ miles S. $\frac{1}{2}$ W. from the southern and largest islet is *Trigger Rock*, a 4 fathoms coral bank, half a cable in diameter.

To the Northward and N.E. of Kimbombo Islets are the following coral reefs and banks:—At 8 cables eastward of the East end of Kimbombo Reef is *Bell Reef*, about 2 miles in length, enclosing a lagoon. *Dibbles Reef* lies 5 miles N.N.E. of the islets; it is $2\frac{1}{4}$ miles long, enclosing a lagoon with no entrance. *Williamson Reef* is a similar reef $1\frac{1}{4}$ mile long, lying $3\frac{3}{4}$ miles N.W. of the islets. *Lookout Reef* lies $10\frac{1}{2}$ miles E. by N. $\frac{1}{4}$ N. of Dibbles Reef; it is $2\frac{1}{2}$ cables in diameter, awash at low water, and the sea breaks heavily on the shallow water extending 2 to 4 cables around it. At $1\frac{1}{2}$ mile N.W. $\frac{1}{2}$ W. of Lookout Reef is *Lewis Bank*, of 8 fathoms, and at $6\frac{1}{4}$ miles N. $\frac{1}{2}$ E. from the reef is *Jeffreys Bank*, of 9 fathoms. *Alacrity Bank*, of 12 fathoms, lies 9 miles N.E. from the reef.

Wailangilala, or Yalangatala Islands consist of two small coral islands, joined by a sand spit, situated at the N.E. part of a reef forming a lagoon, the entrance of which lies about 19 miles East of Nanuku Islets, Nanuku Passage lying between. The islands are low, nearly a mile long, and covered with tropical vegetation, 70 ft. high, but fresh water could not be obtained. They are not inhabited, but are visited periodically by natives of the larger islands, for the purpose of collecting cocoa-nuts.

On the S.W. side of the islands is a lagoon, formed by the reef extending from them; the lagoon is 3 miles long, N. by W. and S. by E., and $1\frac{3}{4}$ mile in breadth. It appeared free from dangers, and affords good anchorage in 15 to 18 fathoms, sand and coral. The entrance to the lagoon is on the West side of the reef, and bears S.W. $\frac{1}{2}$ S. from the South end of the islands; the entrance is 240 yards wide, having a depth of 7 fathoms.

Duff Reef, $8\frac{1}{2}$ miles East of Wailangilala, is $6\frac{1}{2}$ miles long N. by W. and S. by E., and $1\frac{3}{4}$ mile broad; it has a sand kay on its southern end. The Island of Tavuini, 50 miles to the westward, is sometimes plainly visible from it. There is anchorage within the reef, the entrance being on its western side, near its southern end.

NANUKU PASSAGE is formed on the South by Wailangilala, Naitamba, and Yathata, the northern side being bounded by Nanuku Reef and islets, the island of Ngamia, and Taviuni. It is 16 miles wide at its eastern entrance, free from dangers, and is the best route for vessels through the N.E. part of the Fiji group. Vessels from the northward should steer for Wailangilala, and take their departure from thence.* This passage forms the division between Lau or Eastern group, and the main islands of the Fiji Archipelago to the westward.

Nanuku Islets, the *Warner Island* of Wilson, lie about 24 miles E. $\frac{1}{2}$ N.

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* Dangerous Rock, supposed to exist near the middle of Nanuku Passage, was searched for by H.M.S. *Beagle*, and also by H.M.S. *Dido*, in 1874, but could not be found.

from the North point of Taviuni Island; they consist of two small islets, covered with trees, about a quarter of a mile apart, N. by E. ½ E. and S. by W. ½ W. They are situated on the South end of a long reef, about three-quarters of a mile within the extremity; from the islets the reef extends 3 miles in a N. by E. direction, when it forks, the eastern side, only breaking occasionally in light winds, trends thence N.E. by N. 6 miles, when it turns abruptly to the W. by N., approaching within 2 miles of the eastern part of the reef. Thence they trend to the N.N.E., beneath the surface, till they join the Nukusemanu Reefs, the enclosed lagoon being deep with many scattered dangers. On its West side the best entrance is by the *Combe Passages*, with Thombia summit, astern, bearing about W. by S. Anchorage could not be obtained near the islets, the reef being steep-to on both sides.

Nukusemanu (Wilson's *Sandy Island*), situated on the East side of Nukusemanu Reefs is a small sand islet covered with cocoa-nut trees, 23 miles N. ½ W. of Nanuku Islets. Westward of the islet temporary anchorage may be obtained in 14 to 17 fathoms, coral. At 8 miles E.N.E. of Nukusemanu is *Nuku Mbasanga Reef*, enclosing two small islets, a mile apart, covered with cocoa-nut trees. Temporary anchorage, protected from winds between S.W. and S.E. through South, can be obtained 6 cables N.W. by N. of Nuku Mbasanga, the northernmost islet. Boats can land on the N.W. side.

Between Nuku Mbasanga and Nukusemanu is the South end of *Adolphus Reef;* this reef is 12 miles in circumference, with 1 to 4 fathoms over it, and encloses a lagoon, having two entrances on the S.W. side, which can be used by large vessels.

Too much precaution on the part of mariners cannot be used in approaching this part of the group. Several times during the survey, the U.S. brig *Porpoise* was in great danger. The currents and tides are irregular, and much governed by the winds, and at times are found running with great velocity through various and contracted passages. Upon the chart accompanying Wilson's narrative is placed an important caution, which it is as well here to copy:—"Upon these small reefs there is scarce a ruffle of the sea to apprise of the danger."

The two last named islands are included in the group which was named by Captain Wilkes the *Ringgold Isles*, after the Lieutenant-Commandant of the *Porpoise*, who surveyed this portion of the archipelago, to the exclusion of the name bestowed on them by their discoverer, Wilson, or that given by D'Urville, *Janoudza Islets.*

Budd Reef.—At 8 miles westward of the central part of the sunken reefs connecting Nanuku and Nukusemanu Reefs is Budd Reef, of irregular shape, 33 miles in circumference, a great part being sunken. It encloses a deep lagoon, with several islets in it; the only entrance for large vessels is at the South end with the sharp summit of Tambu bearing N. by E. ½ E.

Thombia, the highest of the "Clusters" of Wilson, at the northern end

of this lagoon was named Budd Island by Wilkes. It is composed of volcanic scoriæ and large blocks of lava, rising to the height of 590 ft., and has almost a perfect crater in its centre. The outside or rim of this crater forms the island, and is very narrow at the top; its inner side is quite perpendicular, while its outer side is generally inclined at an angle of 50° or 60°, although in places it is almost perpendicular. It is thickly wooded. At 2 or 2½ miles to the S.W. are *Yanutha*, *Mungaiwa*, and *Iambu*, close together. Yanutha is 480 ft. high, and had two or three inhabitants in 1880. There is good water here. Iambu, 4 cables S.W. of Yanutha, is conspicuous, being 370 ft. high, and densely wooded. At 2¼ miles South of Yanutha is *Rana ni Tinka*, a small islet 150 ft. high, near the barrier reef.

Ringgold Channel divides Budd Reef from the sunken reefs joining Nanuku and Nukusemanu Reefs. On its eastern side are two reefs, each about a mile in length; *Pitman Reef*, awash at low water, lying 7 miles N.E. by E. ½ E. of Thombia, and *Miller Reef*, a sunken reef, 10½ miles S.S.E. of Pitman Reef, the latter breaking heavily in strong South winds.

The S.W. end of Budd Reef lies 8¼ miles N.E. by N. from the North end of Taviuni. *Gangway Rocks* lie between them, making the passage unsafe at night, unless in clear weather with a bright moon. Small vessels drawing less than 6 ft. could find anchorage for the night on the North part of Budd Reef.

THIKOMBIA, or *Chicobea*, is the most northern island of the archipelago, and was discovered by Wilson, in September, 1797; he called it *Farewell Island*. It is a narrow wooded island, 6¼ miles long W. by N. and E. by S., with three conspicuous peaks, the highest of which, 630 ft., is near the West cape. The N.W. coast is bold, rocky, and picturesque; the East point low and sandy. In 1879, there were 256 inhabitants, principally occupying one large village at the East extreme of the island. Mats and tappa are made here, and exported. Small supplies of vegetables can be obtained.

Littlebreak Spit, a ledge of sunken coral reefs, extends 2½ miles S.E. from the East point of the island; there is seldom any break. Small vessels can anchor on the N.W. part of the spit, 3 cables from the shore reef, and 7 cables S. by E. ¼ E. of the eastern sandy point of the island, in 11 fathoms, sand and coral. This small anchorage is not safe in the summer season, or when strong southerly winds prevail. Boats can land at the principal village at half-tide.

Ngele Levu, *Na-Gali*, *Nuku Levu*, or *Qele Levu*, known also as *Nuku Balavu*, is the largest of the eastern Ringgold Isles, and lies 13 miles N. by E. from Nuku Mbasanga Islet. It is of coral formation, about 3 miles in circumference, and covered with cocoa-nut trees, rising 90 ft. above the sea; the East side of the island is nearly steep-to, but there are several small rocks and islets lying off the N.W. end. Fresh water could not be obtained on the island. In 1879 it was inhabited by 22 natives of Fotuna, cultivating sweet potatoes and bananas; the village is on the N.W. side.

On the West side of Na-gali Island, and formed by the coral reef extending

from it, is a lagoon, 12 miles in length East and West, and 5 miles wide at its broadest part; no dangers were found in the lagoon, and good anchorage may be obtained in any part of it in 4 to 16 fathoms, sand. There are three passages into the lagoon, at its West end, suitable for large vessels. Of these, the most convenient and best defined, though the narrowest, is *Rendell Passage*, at the West extreme of the continuous breaking reef which forms the South side of the barrier, on which a sand kay, awash at high water, lies at half a mile East of the passage. From the passage, Observatory Point, the South extreme of Ngele Levu, bears E. by N. $\frac{3}{4}$ N. The channel is 2 cables wide and has 14 fathoms, sand and coral, in the centre. The reef on the North side of the passage seldom breaks. The tides are weak. *Deep Passage*, W. by S. of Observatory Point, is 7 cables broad, but not well defined. *Brown Passage* is at the S.W. extreme of the continuous reef which forms the N.W. side of the barrier; is $3\frac{1}{2}$ cables broad, and has 10 fathoms, coral, in the centre. From it Observatory Point, bears E. $\frac{1}{2}$ N. The reef on the South side of the passage seldom breaks.

Vatauua Island, or *Korotuna*, 16 miles W. by N. $\frac{3}{4}$ N. from Ngele Levu, is about three-quarters of a mile long N.E. and S.W., and surrounded by a fringing reef, extending from 1 to 3 cables from the shore. It is low, but covered with cocoa-nut trees. There is temporary anchorage on its N.W. side, in 15 fathoms, 2 cables from the reef. Boats can easily land on the N.W. side. It is uninhabited.

Between Ngele Levu Reef and Cape Undu, the N.E. extreme of Vanua Levu, a distance of 33 miles are two barrier reefs, 3 miles apart, each about 14 miles in circumference, and enclosing lagoons. *Thakau Vutho-vutho*, the easternmost, being 8 miles from Ngele Levu Reef, has good anchorage in its lagoon, in 15 fathoms; the entrance is on the West side, and is 2 cables broad, marked on its South side by a rock awash at low water. Large vessels can enter it with care. *Thakau Mata Thuthu*, the other, is separated from the former by *Scatterbreak Channel*; the entrance to the lagoon is near its N.W. end, and is 4 cables wide, with a rock, awash at low water, $3\frac{1}{2}$ cables from its southern side. At a mile S.S.W. of the entrance is *Cocks Bank*, a 14-ft. coral shoal, $1\frac{1}{2}$ mile in length.

Tides.—Tide rips are numerous between Cocks Bank and the reef off Cape Undu, but no dangers were observed. Among the Ringgold Isles, the tides are irregular is direction and force; but it may be taken, as a general rule, that the flood stream has "southing" in its direction, and the ebb "northing"; that the former is far stronger than the latter, but seldom exceeds 1 knot, and that vessels beating to the south-eastward will generally find themselves to windward of their reckoning.

TAVIUNI, or **VUNA** is one of the principal islands of the group, being the fourth in point of size. Its length is 23 miles, N.E. by N. and S.W. by S.,

and its breadth 5 to 8 miles. It rises gradually to a central ridge, the highest point of which, *Ngalau Mountain*, is 4,040 ft. The summit is generally covered with clouds. From its gradual rise, and its surface being smoother, it is susceptible of a much higher state of cultivation than the other islands; the soil is a reddish loam, and it is now one of the principal cotton-producing islands of the Fiji group; it also produces coffee, sugar, and copra, and arrow-root and cinchona are grown.

The inhabitants were estimated by Capt. Wilkes to be 7,000 in number, the most savage of all the savage people who inhabited this beautiful archipelago. Cannibalism prevailed here to a greater extent than anywhere else, and the details given, from the reports of the missionaries, are so revolting as to be scarcely credible. However, they stand as records degrading to our nature.

In 1881 the population numbered about 2,558, including 120 whites, the principal settlements being at Vuna Point and Somo Somo; the native chief resides at the latter, and a magistrate and missionary at the former. Fresh water can be shipped at both these places, and beef, mutton, and fowls can be obtained at Vuna. Vessels arriving from ports beyond these islands, before coming here, must first visit Levuka or Loma-loma, to obtain pratique. A steamer from Ovalau calls here every month, besides trading vessels about twice a week during the fine season.

Vuna Point Anchorage, off the plantations North of Vuna Point, the S.W. point of the island, should only be used in fine weather with off-shore winds, as it is small, and the bank of soundings affording anchorage is steep, with bad holding ground; vessels should be prepared to weigh directly a westerly wind sets in, as there is not room to swing. The best anchorage is in 10 fathoms, sandy bottom, with Hamilton Store (a prominent zinc building on the beach) in line with a small house on the hill behind it. There is a landing jetty here.

From Vuna Point the coast, which is steep-to and has no anchorage off it, trends N.E. by N. $\frac{3}{4}$ N., 10$\frac{1}{2}$ miles, to *Wairiki*, a European settlement, with a conspicuous church. Except with strong North and West winds, vessels can anchor in 11 to 15 fathoms, outside the fringing coral heads. From hence the coast continues 2$\frac{1}{8}$ miles in the same direction to *Black Point*, at 1 mile East of which is the town of Somo-Somo.

SOMO-SOMO is the principal town of the island, and is also one of the chief towns of the Fiji group. It contains about 200 houses, built, in a straggling manner, partly below a bluff, and is divided, therefore, into a lower and upper town. The upper town is so much concealed by trees and bushes growing on the bluff on which it stands, that one might be at Somo-Somo many times without noticing it. The approach to it is through a narrow pass, from which there is a beautiful view. There is a trench and a palisade around a great portion of it. It was abandoned by the missionaries, from the dangerous position, for the settlement of Nandi Bay on the South side of Vanua Levu.

Korolevu, or *Goat Island*, about three-quarters of a mile West of Black Point, and 150 ft. high, is surrounded by a reef, which extends about a mile to the southward and westward, and has two small coral heads northward of it, viz., *Phillips Rock*, of 15 ft., at 9 cables N. ¼ E., and *M'Pherson Rock*, of 18 ft., at 1¾ mile N.E. of the island. The town of Somo-Somo bearing E. by S. ½ S., leads in 5 fathoms over the reef or spit, which extends northward from Goat Island, the bottom being plainly visible from the deck. To the eastward of the spit the soundings deepen rapidly to 12 fathoms, and no bottom at 15 fathoms. Between Goat Island and Taviuni Island there is said to be an intricate channel, but fit only for small vessels.

The *Pearl* anchored in 15 fathoms, soft bottom, about a cable from the shore reef, off Somo-Somo town, with Goat Island bearing W. by S., and the right extreme of Vanua Levu Island N. by W. ¾ W. In this part there is a depth of 10 fathoms half a cable from the shore reef, shoaling quickly to 5 and 4 fathoms.

A small river, from which fresh water may easily be obtained, empties itself into the strait near Somo-Somo town; the sediment from the river appears to have settled on the coral reef and formed a soft bank, which affords good holding ground. From the anchorage steer N.W. by W. to pass N.E. of Phillips Rock.

From Black Point *Naiseileseile Point*, the North extreme of Taviuni, bears N.E. ½ N. 8¼ miles; fair anchorage can be obtained off *Ngila*, about halfway between, in from 9 to 17 fathoms, sand and coral, with the planter's house bearing S.E. by E., also in from 6 to 17 fathoms, at 1 mile W.S.W. of Naiseileseile Point. Small vessels can obtain good shelter in either of two reef harbours, which are separated by the coral reef connecting the three small islets off Naiseileseile Point. Off the North end of Taviuni are several detached sunken rocks. *Champion Rocks*, of 12 and 15 ft., lie about 4 miles West of Naiseileseile Point; *Breaknot Rocks*, of 7 ft., at 2½ miles N.W. ¼ W. of the point; *Maté Rock*, of 18 ft., at 2¾ miles N. ¾ W. of it; and *Gangway Rocks*, a group of shallow spots midway between Taviuni and Budd Reef.

Somo-Somo Strait.—The Island of Taviuni is separated from Vanua Levu by a strait 4½ miles wide in its narrowest part, which has been named after the town. The *tides* run from 1 to 3 knots; the *ebb* to the N.N.E. through it, and the flood to the S.S.W.

If bound from Vuna Point to Somo-Somo steer with the East extremity of Rambe Island bearing about N. by E., so as to pass between the shoal patches which extend more than a mile westward of Goat Island and a number of detached reefs which extend about 2 miles from Navukana Promontory, on the West side of the strait; the navigable channel here is only 1¼ mile wide, and very deep. The East extremity of the shoals off Navukana Promontory is in line with the West extremity of Rambe Island when bearing N. ½ W. These reefs seldom break, and the eastern side of the channel should be preferred.

It is a dangerous and tedious passage for sailing vessels. An anchor may be dropped, in necessity, inside *Vienne Passage*, on the West side of the strait.

At 1⅔ mile E.S.E. of Naiseileseile Point is *Miumbani*, an islet 430 ft. high, with cocoa-nut trees on it. From the point the coast, fringed by a reef, trends 6¾ miles S.E. ½ S. to *Thurston Point*, a low point, covered with trees, on the North side of Vure Vure Bay.

Vure Vure Bay (named *Tobou* by Wilkes), on the North side of a small promontory, which is situated on the West side of the southern entrance to Tasman Strait, affords good anchorage in 15 fathoms, sandy bottom, and protected from nearly all winds; a coral reef awash at low water, projects into the middle of the bay. Good water can be obtained from a stream in the S.W. part of the bay. From the North point of Vure Vure Bay a reef extends towards Ngamia Island, contracting Tasman Strait in this part to 6½ cables in breadth; the outlying reefs in the strait are easily distinguished on a clear day.

From Vure Vure Bay the coast trends S. by W. ½ W., 4¾ miles, to *Laveine Point*, a projecting low point with a reef extending 5 cables East of it; several rocks lie to the southward of Vure Vure Bay, as shown on the chart. From Laveine Point to *South Cape* the distance is 14½ miles S.W.; at 3½ miles distant is the village of *Numbani*, and at 6½ miles farther is a sugar plantation named *Salia Levu*, the coast between being rock-bound, with numerous waterfalls. Boats find shelter in a break in the reef off Salia Levu, and vessels can anchor in light S.E. and off-shore winds, in 10 to 15 fathoms, sand and coral, 2 to 3 cables East of the boat harbour.

From South Cape to *Vuna Point* the distance is 4 miles N.W. by W., a barrier reef, enclosing a lagoon, stretching 1½ mile from the latter.

Tasman Strait.—On the eastern side of Taviuni is the strait which was named by D'Urville Tasman Strait, between that island and Ngamia. Though contracted, it affords a safe passage, for vessels drawing less than 18 ft., but should not be attempted except in favourable weather; the best time is during the morning hours, when the sun is to the East of the meridian. Calms are frequent under the high lands of Ngamia, and the tides run 1 to 2 knots, the ebb setting to the northward and the flood to the southward, therefore vessels should not attempt to pass through the strait under sail without the tide and a commanding breeze. There are some coral patches, requiring a careful look-out; the Ngamia shore should be kept on board.

Ngamia, *Quamea*, or *Kamea Island*, on the eastern side of Tasman Strait, is thickly wooded, and the coast indented with deep bays; it is 5¾ miles long East and West, and rises to 1,000 ft. high, with several peaks. It has about 500 inhabitants. On the East side of Ngamia there is a narrow passage separating it from *Lauthala Island*, passable only by boats. Lauthala Island, 3⅓ miles long North and South, rises, with several peaks, to a height of 880 ft.; it is the property of two Europeans. These two islands are surrounded by

a barrier reef, averaging 1 to 1½ mile distant, the enclosed lagoon being navigable for ships except at the East end of Lauthala, where the reef approaches close to the island. Between the reef and the South sides of the islands good anchorage can be obtained in nearly all parts; the only passages leading into the anchorage are formed by two detached patches at the south-western extremity of the reef.

There is anchorage on the North side of Lauthala Island is 12 to 17 fathoms, coral, with the white dwelling-house of the settlement in line with Palm Hill bearing E. by S. and distant 2½ cables; also off the spit of rocks East of this position in 12 fathoms, 3½ cables North of the white house. This anchorage can be reached by three passages through the reefs, with the usual precautions. *Windseye Passage* is 2 cables broad and is well marked, being at the end of the barrier reef 1½ mile N.W by N. ¼ N. of the settlement. From *Closeluff Passage*, 3 cables broad, with a coral patch, awash at low water, in the centre, the East extreme of Ngamia bears S. by E. ½ E., the West extreme of Lauthala, in the distance, just overlapping. *Matangi Passage*, the channel between Matangi and Ngamia, is the best for vessels bound westward. *Matangi* is a small densely wooded, uninhabited island, off the North side of Ngamia; it has two summits of equal height, 440 feet.

Motua Levu, or *Thane Reef*, on which the sea breaks heavily, is about 4 or 5 miles in circumference, enclosing a lagoon, and lies N.E. by E. 1 mile from the N.E. point of the Lauthala barrier reef. *Motua Lailai* is an egg shaped reef, 1 mile in greatest diameter, enclosing a lagoon, 2½ miles E. by S. of Motua Levu, and 5⅓ miles W. ¾ S. of the southern Nanuku Islet, before described.

VANUA LEVU, "Great Land," is the great northern island of the group. It has been sometimes named *Tacanova*, *Tackanova*, *Thakaundrove*, or *Takaou-Nové*, but this is only the name of one of its largest towns, *Dagonrobé* in the Tonga dialect. *Paou*, *Paoo*, *Paw*, or *Pau*, by which it has also been known, is the name of the small island at the East end of Viti Levu, which claims so much authority over the archipelago, or perhaps from the native name of Sandalwood Bay at its West end. All these names are unknown in the island with the exception of the first. The name of Sandalwood Island is now scarcely applicable, inasmuch as the small district at its West extreme, which afforded this wood, has been exhausted. Vanua Levu, in its greatest length, is about 100 miles from N.E. by E. to S.W. by W., and its average breadth may be about 25 miles, but at its eastern end it separates into two peninsulas.

Caution.—On the North and N.W. sides of Vanua Levu, several shoals and reefs exist, whose positions are imperfectly known; a good look-out from aloft is necessary to insure safe navigation. Inside the barrier reef which extends from the North end of Vanua Levu towards the Yasawa group of islands, numerous reefs and sunken patches exist; also between Vanua Levu and Viti Levu there are numerous reefs.

Nateva, or Naceva Bay.—The N.E. extremity of Vanua Levu is *Undu* or *Udu Point*, the termination of a long, narrow peninsula, off which a reef extends 3 miles to the N.E., enclosing a shallow lagoon; the N.E. point of the reef is called *Na Potu*. At 8 miles S.W. of Cape Undu is *Mount Thuku*, a conspicuous saddle-shaped mountain, 1,270 ft. high, with four peaks between it and the cape. The southern side of the peninsula and the coast to the S.W. forms the northern limit of a very extensive bay, or rather gulf, *Nateva Bay*, reaching to within 2½ miles of the South coast of the island. It affords no inducements for commerce or for vessels to venture in. There is no bottom except with a great length of line, and anchorage very near the shore, which is lined by a reef. The land is much broken into volcanic peaks.

At 3 miles S.W. of Cape Undu is *Assawa Harbour*, close southward of Assawa Hill the third peak, 560 ft. high, from Mount Thuku. It may be found by bringing the hill to bear N. by W., but caution must be used as a sunken 6-ft. rock, lies about 150 yards S.W. of the end of the barrier reef forming the South side of the harbour. After rounding it proceed about a mile up the lagoon, and fair sheltered anchorage will be found in 12 to 15 fathoms, with the hill bearing N.W. by W. The natives hereabout number 200, and a European, who resides near Assawa, exports cobra and fibre. The inter-insular steamer calls here every three months.

Rambe, *Rabi*, or *Gillet Island*, forming the South side of the entrance of Nateva Bay, is 8¾ miles long N.E. and S.W. by 4½ miles broad where widest. It is well wooded, hilly, and much broken, the highest peak rising to 1,550 ft. It is the property of some Europeans, who cultivate cotton, sugar, tea, &c., but copra is the chief production. It has several bights in its shore affording anchorage, but is surrounded by reefs, which form a lagoon, studded with rocks, on its S.E. side. From *Texas Point*, the N.E. point, *Texas Reef*, a barrier reef stretches 6¼ miles N. by E. ¾ E., its northern end being marked by rocks 3 ft. high. Vessels can pass through the reef on the West side of the lagoon, and enter the southern part of it through *Texas Channel*, a narrow passage between the shore reef, stretching about 2½ miles eastward of Cape Texas, and the barrier reef.

On the N.W. coast of Rambe is *Virginia Cove*, a small bight in the coral fringe, where two vessels of 300 tons could lie in 14 to 16 fathoms, except in strong North or NW. winds. There are some houses on the beach, and here is the principal plantation. In *Albert Cove*, 1¾ mile W.S.W. of Cape Texas, small vessels will find safe anchorage. To the S.S.W. of Cape Texas are *Small*, *Dawson*, and *Katherine Bays*, affording good anchorage. Dawson Bay is the most secure harbour in Rambe; at its head, near the plantations, vessels can anchor in 11 to 15 fathoms, mud, and the landing is good. To reach these bays from Rambe Channel, Cape Texas bearing N.W. ¼ N. and N.W. by N. will respectively lead to the two *Florida Passages;* and the lagoon may be navigated with the usual precautions. *Rambe Channel* is 5½

miles wide to Budd Reef, and caution must be used, as the reefs on each side seldom break.

On the North side of *Cape Georgia*, the S.W. end of Rambe, small vessels will find secure anchorage in a small cove. Between Cape Georgia and the opposite shore, 3 miles distant, is the narrowest part of *Georgia Channel*, separating Rambe from Vanua Levu. It is narrowed by the reefs on each side, and to the southward the reefs are very numerous, rendering the passage unsafe for a stranger with a large vessel.

Kumbalau Point, on the eastern side of Nateva Bay entrance, has a barrier reef reaching from 1 to $2\frac{3}{4}$ miles from the shore, within which there is anchorage. From hence to *Navukana Promontory*, the S.E. extremity of Vanua Levu, $17\frac{1}{2}$ miles to S. by E., the coast, forming a bight, is fronted by coral reefs and backed by densely wooded mountains. There are several villages, and the natives principally profess the Roman Catholic religion. *Mbutha Bay*, 7 miles N.W. of Navukana Promontory, is $2\frac{1}{2}$ miles deep, affording sheltered anchorage near the shore. It is sheltered to the eastward by Kiaw Island.

Kiaw, or *Kea* (*Tate Island*) lies 5 miles to the S.S.W. of Rambe. It is 5 miles long, N.E. and S.W., and rises to 920 ft. high. On its N.W. side is a harbour, named *Port Safety* by the American surveyors, from the shelter it afforded their vessel in a gale. It is uninhabited, and of a singular form; on it Dr. Holmes, a naturalist, was nearly lost, from missing his way. Many shoal patches lie to the S.E. of Kiaw, and the space between this and Rambe is also studded with dangers.

Navukana Promontory (*Mount Cocoa-nut Point* of Wilkes) has *Vienne Bay* on its western side; this is a deep bay with good anchorage at the N.E. corner, in 13 fathoms, off the plantation. It is approached by a passage through the outer reefs, a mile wide, with a 12-ft. coral bank in the centre.

The *South Coast of Vanua Levu* between Navukana Promontory and *Vuya Point*, 72 miles to the W.S.W., is much indented, about midway being the extensive bay of Savu Savu. From seaward the land appears mountainous and densely wooded, with several peaks from 2,000 to 3,000 ft. high. It is fronted by coral reefs, within which, in some parts, there is navigation for small vessels.

Benow or *Baino Islet*, about a mile westward of Vienne Bay, is low, but covered with palms, and on the shore eastward of it is a village. Between Benow Islet and *Naweine* or *Nabonni Point*, $17\frac{1}{4}$ miles to W. by S. $\frac{1}{2}$ S., the coast forms a bay, with ship passages leading through the reefs to Waikava and Fawn Harbours, and several boat passages for vessels under ten tons, as shown on the chart. Europeans own property in this bay, and also on the coast to the westward.

At 5 miles W. by N. of Benow is *Waikava Passage*, 8 cables long, and $2\frac{1}{4}$ cables wide at its narrowest part, with deep water; it leads to *Waikava Harbour*, where there is anchorage in 6 to 14 fathoms, N.E. of *Thakaundrove*

Island, a low islet, on the West side of the harbour, with a reef extending 2 cables East of it. The harbour is about three-quarters of a mile long East and West, and may be entered by bringing the white church at the village at the head of the harbour N. ½ W., westerly. The village had 150 inhabitants in 1880; water can easily be obtained from a stream 100 yards East of it.

At 4½ miles W. ¾ S. of Waikava Passage is *Naikasa Passage*, not quite so wide, and 9 cables long, with a bend in it. It leads to *Fawn Harbour*, so named from an American brig wrecked here. The harbour is 1 mile long East and West, with good sheltered anchorage in 6 to 12 fathoms, mud; in S.E. winds sailing vessels cannot leave it on account of the direction of the first reach of Naikasa Passage.

From Naweine Point, which is low and wooded, with a village just East of it, to *Savu Savu Point*, the coast trends W. by S. 16 miles, and is fringed by a reef extending from 80 yards to 1¼ mile from the shore, with several islets and rocks on it. There are several breaks in the reef, but none fit for vessels of over ten tons. The most prominent mark along this coast is a peak, 1,110 ft. high, about 6 miles eastward of Savu Savu Point.

About 2 miles West of Naweine Point is the boat passage called *Ngalo-ngalo*, leading to *Salt Lake*, at the N.E. end of which is an isthmus, 300 to 400 yards wide, across which boats and canoes can be hauled to Nateva Bay. On the West side of Ngalo-ngalo Passage is a plantation, with a pier.

SAVU SAVU BAY is the principal opening on the South side of Vanua Levu, and also contains its principal port. It is a fine sheet of water, 10 miles East and West, and surrounded by very high and broken land, rising in many places into lofty, needle-shaped peaks, some of reach the altitude of 2,000 to 3,000 ft. The bay is comprised between Savu Savu Point, the extremity of a promontory which is an excellent landfall, and *Kumbalau Point*, 13 miles S.W. by W. ½ W.; the western part is protected by a barrier reef through which there are three passages. Its eastern part is very clear, but the western half is much encumbered with reefs. Much of the land around the bay is owned by Europeans. There are many good anchorages in the small bays around its shores, the best being in those at its eastern corner.

Yams, bananas, &c., can be obtained from many of the plantations. A steamer calls once a month at *Naveria*, and there is communication with Levuka about once a week, by small craft.

Off Savu Savu Point the reef extends 1½ mile S.W. ½ S., with an islet on it, and is awash at low water. Between this and the sunken reefs 1½ mile to the westward, is *Point Passage*, the main entrance to the bay. At 9 miles W.S.W. of Point Passage, and 3 miles N.E. of Kumbalau Point, is *Nyavu Passage*, another entrance through the reef, 6 cables wide. A mile eastward of Kumbalau Point is a third but very narrow entrance called *Kumbalau Channel.*

Valanga Bay, at the East end of Savu Savu Bay, is 6 cables broad, with

sheltered anchorage in 10 to 19 fathoms, stiff mud, off the mill, but a coral patch, nearly awash at low water, lies in the middle of it. Water can be obtained from a stream in its S.E. part. About 1 mile farther South is *Sava-reka-reka Bay*, 2½ to 7 cables wide, with anchorage in 6 to 18 fathoms, mud; on its South side is a reef encircling *Nawi Island*, which forms the North side of Na Kama Creek.

Na Kama, or *Waicama Creek*, is 6½ cables long E. by N. and W. by S., and about 150 yards broad, with a depth of 6 to 15 fathoms; it would make a fine site for a dock. On its South side are the hot springs of *Waicama*, five in number, at 200 yards from the beach. A cold stream flows by them, but the springs have a temperature of from 200° to 210°. The springs are very copious, covering a considerable extent, and are used by the natives at times to cook their food. Their vicinity was formerly populous, as a strong fortress near indicates. Here is the village of *Moniseva*, where fresh meat can be obtained, and at *Ndaku*, 1 mile to the westward, with some hot springs between, fresh water can be obtained.

It is high water, on full and change, in Valanga Bay, at $5^h\ 55^m$; springs rise 5¾ ft., neaps range 2¼ ft. From Kumbalau Point to *Soni Soni Island*, the distance is 4 miles S.W. ¼ W., and off it is a barrier reef, inside which anchorage can be found, but the water is deep and the bottom uneven. Soni Soni Island is 460 ft. high, and on its North side is a boat harbour, enclosing a small islet with a native village on it.

At half a mile South of the island is *Soni Soni Passage*, 1½ mile long and 360 yards wide; the course through is W. by N. ½ N., and with a good pilot, it may be boldly taken under steam or with a fair wind. As H.M.S. *Esk* passed through, in 1867, the ebb tide (springs) was setting strongly through to the eastward, and spreading out like a fan as it quitted the horns of the reef.

Namena, or *Direction Island*.—From Soni Soni Passage a barrier reef stretches off 15 miles S.E., and in the lagoon enclosed by this reef, at 3½ miles from its S.E. end, is Namena Island, 1 mile long, rising to two regular hills, 320 ft. high, covered with dense foliage. It is not inhabited, being only occasionally resorted to by the natives. The reef, on both sides, is in detached patches between which vessels can pass. Vessels drawing 11 ft., or under, can cross the reef by the *Save-a-tack Passages*, the northern of which is found by bringing the West extreme of Namena in line with the East extreme of Makungai Island, S. ¾ W.; the South passages are numerous.

At 7 miles W.N.W. of Namena Island the reef takes a W.S.W. direction, and at 5 and 12 miles respectively from this part are the Nandi and Vuya Passages, openings which lead through to the coast. Besides these are some others. *Nandi Passage* is 9 cables wide, with from 12 to 16 fathoms, according to Admiral Erskine; one or two rocks, distinguishable by the eye, lie in the way. *Vuya* or *Buia Passage* has about the same depth, and is very narrow, but with care is fit for a large ship.

From the Vuya Passages the barrier reef, much broken, trends irregularly to the S.S.E., ending, at 21 miles distant, at a sharp point on the North side of Makongai Channel, hereafter described. At 6½ miles W. by N. ¾ N. from the point is *Na Vatu* or *Passage Islet*, 130 ft. high. From hence the reef trends 15 miles W.N.W., and then alters its direction to N.N.W., gradually rounding till it approaches within 4 miles of Vuya Point, whence it again continues to the N.W., facing the West end of Vanua Levu. The extensive enclosed lagoon has deep water, with many scattered reefs and dangers.

The Coast.—From Soni Soni Island to *Solevu Bay*, the distance is 13½ miles S.W. by W. ½ W., the coast between falling back and forming a deep bay. On the western side of this bay is Nandi Bay.

Nandi Bay is 5 miles to the N.E. of the South point of Vanua Levu, and is the site of a mission station, which was established after the abandonment of Somu-Somu on Taviuni. The natives here are very wild, though they have been brought to attend to the good offices of the mission. On the shores of the bay and the River Nandi are some of the best plantations of the group.

Beyond *Vuya* or *Buia Point*, the S.W. point of Vanua Levu, the passage through the reef becomes still more intricate; and opposite *Rabe-Rabe Island* it is quite narrow, though there is sufficient water for any vessel. The *Peacock* was easily taken to Lekumbi Point, the S.E. point of Sandalwood Bay.

Off Cocoa-nut Point, at the S.W. end of Vanua Levu Island, the reefs extend in irregular patches from the shore, which should not be approached within a mile. *Sesaleka Peak.* bearing N.W., northerly, leads clear. This peak, 1,370 ft. high, from its prominent position to the N.W. of Sandalwood Bay, is visible from many points, and is of great service as a clearing mark.

Captain Worth's observations on this coast, made in H.M.S. *Calypso*, on 28th of July, 1848, are as follow:—

"Having passed through the sea reef by the Mokungai Passage, we again entered it through the passage of Buia, which is nearly opposite So Levu, or Sua Lib; but it becoming dark, I anchored for the night under shelter of the sea reef, and on the following morning anchored off So Levu, half a mile distant.

"This anchorage is by no means a good or a safe one; for, although in some measure sheltered by the sea reef, it is too distant (6 miles) to afford it effectually; and when blowing strong either along shore or upon it, a high sea gets up. Trading vessels usually prefer anchoring off Rangi-Rangi, or Cocoa-nut Point, which is about 6 miles further to the westward. Within the sea reef the current is often very strong, and is principally governed by the strength of the wind and the force of the sea breaking over. Its rise and fall are 5 ft., which is about the average amongst all these islands."

Mbua, or Sandalwood Bay, though much filled with large reefs, offers ample space for anchorage. The holding ground is excellent, and the water not too deep. The bay is of the figure of a large segment of a circle, 6 miles in diameter, and is formed by Lekumbi Point on the East, and that of

Nai Thombo-Thombo, or *Dimba-Dimba*, on the West. The land immediately surrounding it is low, but a few miles back it rises in high and picturesque peaks. That of *Corobato* is distinguished from the Viti Levu shore, and is 2,000 ft. high. The shores of the bay are lined with mangroves, and have, generally, extensive mud flats. There are few facilities here for obtaining either wood or water, as the anchorage is a long distance from the shore. Several small streams enter the bay in its upper part, flowing from some distance in the interior. This was the principal place where the sandal-wood was formerly obtained, and from which the island was best known; and it is from here that very large quantities have been shipped, but it has been for some years exhausted.

Dimba-Dimba Point, the West extreme of Sandalwood Bay, is considered by the natives as sacred ground, and is strictly kept from any kind of disturbance. It is a most beautiful spot; the trees flourish on it in contrast to much of the surrounding country.

"As a good anchorage, Sandalwood Bay is very superior to any in the Fiji group; indeed, it can hardly be surpassed anywhere. It is spacious, and a great portion of it clear from shoals, with a mud bottom, and a draught of water varying from 6 to 8½ fathoms; it is perfectly sheltered on three sides by land, and on the fourth, or sea-side, by the reefs. Water can only be procured by sending some distance, and is not of good quality. Stock is to be obtained at all other anchorages, but not so abundantly, there being but few inhabitants on this part of the island. The passage from Sua Lib to Sandalwood Bay, from the numerous reefs and patches, is confined and intricate till off Cocoa-nut Point, when it becomes clearer. The shoals and reefs may be distinctly seen, provided the caution is used of having a clear and bright sun behind you, and steering from the mast-head. We found the tide from 1½ to 2 knots, the flood setting to the westward, and the ebb to the eastward."—(*Captain Worth*, R.N.) The *Calypso* anchored in 6½ fathoms, Lekumbi Point bearing W. ½ S., and Dimba-Dimba S. ½ W.; off shore, from the bottom of the bay, about 1½ mile.

Captain Powell, of H.M.S. *Esk*, says:—At Lekumbi Point, the southern boundary of Sandalwood Bay, there is a patch of cocoa-nut and other trees connected with the main land by a long, narrow spit, densely clothed with mangroves. The channel to Sandalwood Bay is wide and clear, and the chart, with mast-head pilotage, a sufficient guide. There is excellent anchorage in the bay with any required depth of water, and as the land is low and flat, rising very gradually to the neighbouring hills, it would be found a good refuge in a hurricane, and free from the devastating squalls which are whirled from the high land of Ovalau and other harbours, and which occasion such danger to shipping.

To reach the anchorage in Sandalwood Bay, off Mbua River, round Lekumbi Point at the distance of 3 cables, bring it to bear S.S.W., and keep

this bearing on until Sesoleka Peak bears N.W. by W. ½ W. In this position there is 6 fathoms, soft mud, into which the anchor sinks considerably.

Across Sandalwood Bay to Mbua the soundings decrease gradually from 14 fathoms at the entrance. The River Mbua is marked by stakes, and has from 2 to 3 ft. on the bar, deepening to 1½ fathom up to the town, distant about a mile from the entrance. For the first half mile the river winds sluggishly through a dense mangrove forest, after which it passes through a pleasant open level country, the banks being steep-to.

H.M.S. *Pearl*, in going from Sandalwood Bay to Levuka, after passing half a mile outside Cocoa-nut Point, steered a S.E. by E. ¾ E. course for the westernmost of the Vuya Passages, which appeared on approaching it to be about 3 cables broad, whereas there are several sunken passages contracting it to about 1 cable; no bottom was obtained with the hand lead in passing through this passage. Several openings were seen through the reef, and there is said to be a better passage further to the eastward.

The only dangers known to exist between Cocoa-nut Point and Vuya Passages, are a long reef stretching out from Vuya Point, and a coral shoal about 2 miles from the point; the *Pearl* passed through the channel between this reef and shoal. A long reef is said to extend from Solevu Point in a south-easterly direction.

Yadua or Yendua Island lies to the West of Sandalwood Bay, and 8 miles from the western end of Vanua Levu, the interval between having much foul ground with coral patches. Yendua is deeply indented, and off its S.W. end is an islet, with a boat passage between them. This island, composed of a black volcanic conglomerate, is about 12 miles in circumference. *Porpoise Harbour* lies on its South side; it is very pretty, and its form is that of a large segment of a circle, 1½ mile deep, and 1 mile wide. It is open to the S.E., but protected by a double reef, on the East side of which is the entrance. The islet shelters it on the West. There is anchorage in 10 fathoms in its western part, about 2½ cables from the shore.

North of Dimba-Dimba Point is a high peak, which has a town perched on its very top. Beyond this is *Ruku-Ruku Bay*, which has a reef across its mouth, leaving only a narrow ship channel into it. *Nai Vaka*, or *Ivaca Peak*, on the North side, is a high and bold bluff, 1,563 ft. high, with a town on its summit. The *Island of Yangaga*, or *Anganga*, is immediately northward of this peak. To the passage between them the American surveyors gave the name of *Monkey-face Passage*, in consequence of one of the rocks having a remarkable resemblance to that animal. Yangaga Island is 600 ft. high and very much broken; it is not inhabited, and offers nothing but turtles in the season. Anutuga, Viedrala, Tavea, and Galoa, are rocky islands, from 50 to 150 ft. high, lying off the coast to the E.S.E. of Yangaga.

From the point known as Nai Thombothombo to Ruku-Ruku Bay the land rises gently to the neighbouring hills, and is indented by numerous small bays

fringed with mangroves. The peninsula forming the North side of the bay, and the South side of Monkey-face Passage, is very remarkable in appearance; the numerous peaks and knobs are enormous blocks of stone, black and bare, rising from a large steep mound of earth, slightly clothed in some places with small trees and scrub; on the Monkey-face Passage side the land rises very abruptly from the sea.

In crossing Ruku-Ruku Bay, bring Seseleka Peak to bear S. ½ E. until abreast of Sleepy Point, which derives its name from the fact of the *Flying-fish* of Capt. Wilkes's expedition having been run upon it by a hard-worked pilot, who fell asleep aloft. After rounding Nai Vaka, many reefs will be seen, including one in the centre of Monkey-face Passage, but leaving easily navigable channels with 13 fathoms for steam or fair wind.

Naloa Bay is a wide opening, protected on the North by two or three small islets, one of which, *Tavea*, has been bought by a company of native fishermen; and on another a large biche-de-mer house was erected by Capt. Eagleston, of the *Leonidas*, who afforded the expedition much useful information relative to the group. The town of Votua lies about a mile from the shore. The natives, from being more accustomed to visitors, procured ample supplies of wood and water for the American ships.

Off Yanganga Island the outer edge of the Great Sea Reef is 11 miles distant to the northward. Its direction is about East and West at this part, and it then takes a somewhat more southerly direction toward Round Island, hereafter described. There are several small openings through its outer edge, necessarily very dangerous, if practicable, and when within there are many sunken coral patches.

The islands on the coast, from Naloa Bay to Muthuata, a distance of 21 miles, are for the most part low, and covered with titi (mangrove) bushes. There is one about 2½ miles S.W. of Muthuata, called *Nakubati*, or *Nucumbati*, which is remarkable in shape as well as picturesque in appearance. On this is a deserted town of about sixty houses, situated in a beautiful grove of cocoa-nut trees.

The town of *Mhattuua* consists of about 100 houses, built closely together, and is situated in an open valley close to high-water mark. It is very much exposed, and quite defenceless; it has but few trees upon it, and is one of the best built towns in the Fijis. The style of building resembles that of Rewa. Immediately off the town lies the *Island of Muthuata*. This island not only protects the harbour from the North wind, but adds much to its beauty, by its high and luxuriant appearance. It is little more than a mile in length, and appears to have been a long time the burial place of both chiefs and common people. At 11 miles North of it is *Kia*, or *Kie Island*, about 900 ft. high, which is conspicuous and included in the barrier reef. The land on this part of the coast of Vanua Levu rises abruptly from the water in volcanic peaks, to the height of 2,000 ft. and upwards.

At 16 miles eastward of Muthuata is the island of *Mali*, which is thinly inhabited. To the N.W. of the islet off its West end is the *Mali Passage*, through the outer reef; and at 13 miles still further is the last opening on the North coast through the outer reef to the ship channel within it. It is called the *Sau-Sau Passage*, and lies at 34 miles W. by S. ¼ S. from Cape Undu. There is, however, one tolerably good harbour in the interval, called *Tibethe*, and there are several towns around the bay.

" Sau-Sau Passsage is broad and deep, and may be recognized from seaward by Drua Drua Island, Kaveva Island, Monk Rock, and two rocks nearer the outer edge of the reef, which appear like vessels under sail.

" *Kia Island*, 22 miles to the westward of Sau-Sau Passage, stands on a projection of the reef 12 miles from the main land, and forms a good mark for this part of the coast; in clear weather Kia Island can be seen from a distance of 35 miles."—H.M.S. *Challenger*, 1875.

H.M.S. *Pearl*, in 1874, after passing in through Sau-Sau Channel, skirted the sea reef at a distance of about 2 cables, in 12 to 13 fathoms, as far as Sau-Sau Island. After passing the island it would be advisable to keep nearer the sea reef, to avoid the numerous shoals. H.M.S. *Pearl* thence proceeded to the westward, but as the directions drawn up by her officers would be of little service without local knowledge, we do not give them in detail; the chart will give a far better idea of the intricacies of the navigation than any verbal description. Good anchorage was obtained in 10 fathoms, with Sau-Sau Island bearing N. by E. ¼ E.; Kia Island W. ¼ N.; and Mali Island S.W. by S.

Mali Island has a small island near its West end, named Voro Voro; the channel between them dries at low tide. Off the North end of Mali Island, and about mid-channel, there is a shoal, having apparently less than 3 fathoms over it. From the N.E. end of Voro Voro Island a shoal spit extends about 1 cable in a northerly direction.

H.M.S. *Esk* passed along the N.W. coast of Vanua Levu in November, 1866. The following remarks were made:—Proceeding to the north-eastward, the land becomes low and undulating in outline, bare and brown in appearance, and backed by lofty hills and peaks of most fantastic shapes, the coast line, with rare exceptions, being fringed with mangroves. The islands *Vatu* and *Nuvera* consist principally of dense mangrove swamps, very low and flat; Nuvera rising a few feet on the N.W. side, upon which a few cocoa-nut trees and bushes grow. *Nyaloa*, *Vendrala*, and the other islands on the South side of the usual inshore track, rise to a few feet elevation, and are clothed with trees. The channels between them are contracted by several shoal patches.

Proceeding to the N.E., the *Esk* rounded Vana Point close-to in 9 fathoms. This point is backed by a perfect maze of hills and dales, the former being topped with rugged black stones. Continuing on to Muthuata Island and

Nanduri beyond, the land rises abruptly from a narrow belt of level to rocky-topped hills sparsely wooded, and from 800 to 1,200 ft. high.

To proceed to Nanduri, after passing along the South side of Muthuata Island, steer for some mangrove islets 3 or 4 miles further to the N.E., rounding a long mangrove spit extending from the mainland, with a reef and detached patch off it, and anchor as convenient in about 8 fathoms, soft mud, excellent holding ground. To the eastward of Nanduri there is a rock among the hills, strongly resembling a Hindoo idol.

Ndreketi River.—Off the mouth of Ndreketi River, to the S.E. of Nuvara Island, are extensive mud banks, falling gradually into deep water, and through them the river has worked a channel, the depth of which was not ascertained, but it was reported that a vessel of 90 tons had passed through into the river, the entrance being 300 yards wide, with a depth of from 2 to 3 fathoms in the deepest part, which is considerably narrowed by mud banks. Soundings were obtained on ascending the river to the distance of 4½ miles from the mouth, and here 4½ fathoms was obtained.

To a distance of 2 miles from the entrance the country consists of dense mangrove swamps, but beyond the Ndreketi expands into a small basin, in the centre of which is the small islet of Nambukavu, strongly fortified, and crowded with houses, affording shelter to a population of about 250 persons, living in a lamentable state of squalor and dirt, whom recent wars had compelled to quit the pleasant banks of the river in the immediate neighbourhood, where the vestiges of several towns yet exist. The general trend of the river is in a S.E. direction, and the mangrove of two descriptions, one being a large bush, and the other a tree growing to the height of 20 ft., with a substantial looking trunk, which makes good fuel.

The North shore of Vanua Levu appears to be well peopled. The total population of the island, as gathered by D'Urville, is 10,000.

Mr. Williams, the resident missionary, in 1849, considered that the number was 10,000 or 12,000—an insignificant number compared with that of the whole archipelago, but it is generally poor and infertile. Mr. Bensusan, in 1860, stated it to be 20,000. It has been estimated at two or three times this number.

Between the eastern and western groups, and to the southward of Vanua Levu, is a range of islands, of which some are possibly the same seen by Bligh, in the *Bounty's* launch, in his progress westward, in May, 1789, and which then appeared on the charts under his name.

KORO, or *Goro*, is considered by the natives one of the most fruitful islands of the group. The produce of Goro, previous to the cotton plantations being established, was oil and tortoise-shell, and exceeded in quantity that of any other island of the group; copra, maize, and arrow-root, are also exported. Its population in 1879 was 1,270, including 10 Europeans.

This island, situated about 35 miles to the N.E. of Ovalau Island, was par-

tially examined by Navigating-Lieutenant H. Hosken whilst sailing round it in H.M.S. *Alacrity*. It is 10 miles long North and South, and about 5 miles broad at its northern end. The mountains in the interior attain a height of 1,840 ft., and are densely wooded. *Point Alldin*, the South point of Goro, is about 150 ft. high, and much lower than the rest of the land; the adjacent hills being 1,000 ft. high, and extending North in a ridge, with spurs jutting to the westward. The S.E. point is thickly covered with cocoa-nut trees.

A reef, on which the sea breaks heavily, fringes the East and South sides of Goro Island, and ends in an elbow, the extremity of which is three-quarters of a mile to the southward of Point Alldin. There is no fringing reef off the western shore of the island for 4 miles to the northward of Point Alldin. Thence to *Nola Point*, the N.W. point, there are several reefs from a half to three-quarters of a mile from the shore. Off the North coast are also several dangerous reefs, but in no part do the reefs extend more than $1\frac{3}{4}$ mile off. Vessels should give the North coast a berth of at least $2\frac{1}{2}$ miles in passing at night.

At 1 mile S.E. of Nola Point, which has a conspicuous mound over it, 240 ft. high, is *Tulane Cove*, a small harbour well protected from all directions but N.W., with good anchorage in 14 fathoms, sand and coral, off the village of Cavalailai. On the reef, extending westward, which forms the South protection of the cove, there is a sand kay 1 ft. above high water, and also (at the extreme) a rock 3 ft. high; the West protection of the cove is a line of coral heads, stretching N.W. by N. 4 cables distant from the sand kay.

Smoothwater Reefs consist of numerous detached coral shoals, awash at low water, lying from half a mile to $1\frac{3}{4}$ mile from the shore, between Nola Point and Nambuna village, which is 3 miles to the E.N.E. of it. Between the coral shoals there are several passages fit for boats.

Stone-axe Roads are protected on the East by the Vatu Leile Reefs, and on the N.W. and West by the Smoothwater Reefs. On the North, the only protection is a line of sunken rocks. The entrance, which is $4\frac{1}{2}$ cables wide, may be found by bringing Nola Point to bear S.S.W. There is good anchorage off Nambuna village in 9 to 15 fathoms, sand, but there is more shelter and better landing off Nandawa and Matana, a mile to the westward. Supplies of beef, poultry, yams, &c., can be obtained on the North coast of Goro, and water can be shipped at Nambuna.

To the eastward of Nambuna, *Vatu Leile Reefs* extend nearly $1\frac{1}{2}$ mile from the shore, and a spit, on which the sea breaks heavily, extends 1 mile N.N.E. from *Nathomaki Point*, the N.E. point.

The East side of Goro Island, as before remarked, is fringed by a reef. For 3 miles to the southward of Nathomaki Point, the reef does not appear to extend much more than a quarter of a mile from the shore; but off Nangaindamu, 5 miles southward of the point, there are detached reefs reaching from three-quarters to $1\frac{1}{4}$ mile from the coast.

Nangaindamu Harbour has two entrances, called the North and South passages, suitable for steamers or small sailing vessels. The former, lying North and South, is narrow, long, and winding. The South passage is 1 cable wide, with 21 to 27 fathoms in mid-channel; dangerous spits extend off either horn of the passage, and from inside of the South horn a line of sunken rocks extends in a north-westerly direction for 3 cables. Therefore a N.W. course must be steered on first entering the harbour. There is anchorage in 4 to 8 fathoms, 3 to 5 cables S.E. of the village, or in 12 to 20 fathoms under the lee of the large detached reef, which forms the easterly protection of the harbour. There are several coral heads in the harbour not easily seen on account of the muddy water discharged from the streams.

The East coast southward of Nangaindamu was not closely examined, but the fringing reef appears to extend about a mile from the shore. There is said to be anchorage off Morey's plantation near East Point, about 3 miles from Nangaindamu.

MAKONGAI and Wakaya.—At 22½ miles W. by S. ½ S. from the South point of Koro is Makongai Island, about 2 miles in diameter and 876 ft. high, the property of a European engaged in sheep farming. It lies at the N.E. part of an extensive barrier reef, which has somewhat the shape of the figure 8, 18 miles in length N.W. by N. and S.E. by S., and enclosing two lagoons, separated by the junction of the reefs at about 3 miles southward of Makongai, the island of Wakaya lying on the southern part. On the West side of Makongai is the small harbour of *Dalithe*, formed partly by reefs and partly by the small island of *Makondranga*. On the N.E. side of the reef surrounding Makongai, is a narrow passage, *Daveta Loboni*, with three sunken coral knolls in it, with not more than 12 ft. on them, contracting it to about three-quarters of a cable in width.

From Makongai summit *Vatu Vula*, the N.W. point of the reef, bears W. by S. 3¼ miles, and is always breaking. It lies on the South side of the *Makongai Passage*, which is 2 miles wide between this reef and Passage Islet reef (p. 706). Vessels usually pass within half a mile of Vatu Vula to avoid the latter. This passage may at times be difficult from the tides, the flood running to the South and West, and the ebb in the reverse direction.

At 8 miles S.S.E. of Makongai, and 9½ miles N.E. by E. of Levuka, in Ovalau, is *Wakai Island*, 4½ miles long, and 595 ft. high, lying on the western side of the reef. It is the property of two Europeans. There is a remarkable shelf formed near the centre of the island, which goes by the name of the *Chieftain's Leap*, from a tragedy which happened some time ago. Some remarkably fine samples of cotton have been grown on Wakaya. On the N.W. point of the island there is a stone landing place, and on an eminence near it a flagstaff and observatory. A homestead, belonging to a large cotton and coffee plantation, is situated in the N.E. part of the island, facing a bay.

There are several openings through the reef near Wakaya, on its eastern side, but they cannot be recommended except for small vessels. The entrance on the S.W. side, leading to *Flying Fish Harbour*, is quite narrow. H.M.S. *Alert*, 1880, steamed through the passage northward of Wakaya, known as *Daveta Ni-kai-drai-imba*, which was found to present no difficulties with a suitable sun. Vessels passing between Ovalau and Koro, frequently use this passage.

The southern extremity of the reef is $3\frac{3}{4}$ miles S.E. by S. from the South point of Wakaya. These islands are visible from Ovalau, from which they are separated by a strait 10 miles wide.

"This part of the group is dangerous in dark nights and uncertain weather, no anchorage nor shelter being within reach, nor can any of the passages between the long belt of reefs which extend from the South of Vanua Levu to the South side of Viti Levu, an extent of 60 or 80 miles, and which forms a lee shore, be attempted at night, these difficulties being increased by the uncertain set of the currents, which are often strong. It is necessary, indeed indispensable, that to sail amongst the reefs and shoals of these islands, with any degree of safety, the day should be clear, and the sun bright and behind the ship, and the time of low water chosen, if possible, when they can always be distinctly seen, and with care avoided; and when the sun is ahead of the ship, or the day becomes dull, she should be at once anchored, as the shoals can no longer be distinguished; this remark of course attends vessels navigating inside the different sea reefs, for without them there is no anchorage."—*Capt. Worth, R.N.*, H.M.S. *Calypso*, 1849.

Horse-shoe Reef (*Thackau Momo*), 11 miles N.W. of Nairai, is of the Atoll order, awash at half ebb, presenting a wreath of foam of a mile in diameter, with but one narrow opening on the N.W. side to a basin of 12 fathoms depth. There is 180 fathoms water, coral grit bottom, at a cable's length off, and no bottom with 410 fathoms at a mile off. The distance between this dangerous reef and the northern elbow of that bounding Nairai Island is $7\frac{1}{2}$ miles.—*Capt. Denham.*

NAIRAI ISLAND is 32 miles E. $\frac{1}{4}$ S. of Levuka, in Ovalau. It lies North and South, 4 miles in length, and 3 miles in breadth, surrounded by a reef which borders the West end at the distance of 5 miles, and the North and South extremes at 4 miles. An opening, which leads into sheltered anchorage, of 3 miles in extent, having from 10 to 15 fathoms water, lies with the Needle Peak bearing N.N.E., but in going in, keep a mast-head look-out for 9-ft. coral patches. The *Needle Peak*, 1,078 ft. high, rises in the northern part of the island, in 17° 48′ 33″ S., and 179° 25′ 30″ E. It is high water, on full and change, at 5^h 53^m; springs rise 4 ft. 7 inches. The population, 1,162 in 1856, all Christianized under the Wesleyan mission, are a most friendly people, and in all respects resemble those at Ngau. In 1880 they numbered 612, with one European.

It was fully examined by the American expedition, from which is derived the following :—

There is a passage between this island and *Mothea* or *Eliza Reef*, stretching off from the island towards the South ; and there are also a passage and harbour between the reef and the island. *Kobu* or *Cobu Rock* is a good mark for the former passage when it bears East. It lies a mile South of the South point of Nairai, and is 90 ft. high.

The boats anchored in the harbour of *Venemole*, on the West side, which may be known by two small islets joined to Nairai by the reef, which forms a protection against the North winds, and vessels of any draught of water may anchor here in 15 fathoms, with good bottom, from a quarter to half a mile from the shore. Somewhat further to the southward is a 3-fathoms bank, which is the only danger that exists inside the reef towards the Cobu Rock or S.W. Passage. About a mile to the North is *Venemole Bay*. It is circular, with a narrow entrance, affording seemingly a good harbour; but, on examination, this entrance proved to be quite shallow. The bay had the appearance of having been an old crater; at low water it may almost be said to become a lake. The officers were much struck with the beauty of the bay. It contains a village of the same name, and also another called *Fulailai*, but both are small. The natives were quite peaceable.

They anchored at night off the town of *Toaloa*, which lies in a bight at the North end of the island, and proved the largest town on the island.

Nairai is famous for its manufactures of mats, baskets, &c., a large trade in which is carried on throughout the group by exchanges.

The reef extends from the islands 4 miles northward, and, where it ends, turns for a short distance to the westward. There are a few patches of rock on its western side, but none further from it than half a mile. This is the reef on which the U.S.S. *Flying Fish* struck on entering the group, and where she was near being lost. It does not join the island, but is connected with Mothea or Eliza Reef; and there is between it and the island a good ship channel, leading to the large Bay of Corobamba. On the eastern side of this bay there is a safe anchorage in 13 fathoms, with a white sandy bottom. The reef extends to the South, and then passes between Cobu and Nairai to the S.W. The only danger is a small coral patch, lying E.S.E. a mile from the South end of the island, and a mile North of Cobu Rock.

The town of *Corobamba* lies at the bottom of the bay, next in size to Toaloa. *Cobu Rock* is a singular one. It is inaccessible on three sides, of volcanic formation, and is enclosed by Mothea Reef, which here spreads to the width of about 3 miles, and extends 4 miles further South, where it forms a rounded point. The eastern side is an unbroken reef, but the western is somewhat irregular and broken, with many openings for boats.

Mothea Reef has obtained the name of *Eliza Reef*, from the loss of that brig in 1809. She had both guns and powder on board, which were thus intro-

duced among the natives, which brought about a great change of power; a large amount of dollars also came into their possession.

NGAU, Goa, pronounced Angau (an N being always prefixed to a Fijian word or syllable beginning with g), *Nhow*, or *Neow*, is 8½ miles S.W. of Nairai, and 27 miles south-eastward of Ovalau. It extends S.E. and N.W., 11¼ miles in length, and 6 miles in breadth, and is surrounded by a barrier reef of 38 miles circuit, ranging 3½ miles off the western side of the island. There are three closely connected, but intricate, ship entrances on the north-western side, leading into a sheltered roadstead having 20 fathoms water, and spreading over 16 square miles. The leading mark for the best of these entrances is the peak of the island, bearing E. ½ N.; the peak is 2,345 ft. above the sea, in lat. 17° 59′ 29″ S., and long. 179° 17′ 30″ E. There is 200 fathoms water close to the reef, and as much as 800 fathoms, oaze, between the islands. It is high water in the roadstead, on full and change, at 6ʰ 7ᵐ; and the rise of tide is 5 ft. The population in 1856 was 3,173, wholly converted to Christianity under the Wesleyan Mission, and are very friendly towards the British people. A vessel can be supplied with yams and pigs. Wood is obtainable, but there is no facility for watering.—(*Capt. Denham.*) In 1880 the natives numbered 2,163, with two Europeans.

Mumbolithe Reef, before referred to, is 4½ miles South from the southernmost elbow of the boundary reef of Ngau. It lies nearly North and South, 1¼ mile in length, and half a mile in breadth, forming, with no opening, a very shallow basin of smooth water, of a pale green hue, like all these reef-basins. The centre of the basin is in lat. 18° 13′ 25″ S., and 179° 19′ E. There is 190 fathoms water at a cable off, and as much as 750 fathoms, over coral grit, between it and Ngau. It always shows heavy breakers.*

Mbatiki, *Batiki*, or *Ambatiki*, nearly midway between Nairai and Ovalau, is a deeply indented island, 2 miles in diameter, surrounded by a reef, which offers no protection for vessels, and only passages for boats. The island is 609 ft. high, of a dome shape, and contained 342 inhabitants in 1880. The people, 509 in number at that time, were civil to Wilkes's party, and gave them yams and taro in plenty, but would not part with any pigs. They live in villages, and appear thriving. The island has very little wood on it. The reefs extend half a mile from its shore.

MOALA, or Mouala (if it is not the *Mywoolla* discovered by Bligh in 1792), may be considered as a discovery of D'Urville's, for it was very incorrectly

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* Sunken rocks have been reported to lie between Ngau and Moala, in lat. 18° 24′ S., long. 179° 34′ E.

Metcore or *Meteor Reef*, awash, reported on French authority as lying in lat. 18° 22′ S., long. 178° 53′ E., is very doubtful, H.M.S. *Pearl* having passed over the assigned position without seeing any signs of shoal water. In 1876 H.M.S. *Alacrity* passed near the reported position, but saw nothing of the reef.

placed on the charts under the name of *Merla Eavou.* It is of a triangular form, lying N.N.E. and S.S.W 7 miles long, by 6 miles broad, the barrier reef projecting 3 miles off its South and N.E. points, and 1⅔ mile off its West point. It is mountainous and volcanic, 1,535 ft. high, and covered with wood. There are some clusters of cocoa-nut trees on the shore. The island is deeply indented on its eastern side, forming a bay 2 miles deep and three-quarters of a mile wide, with depths of 10 and 20 fathoms, the approaches being intricate for a large ship. The summit of Moala, kept on the bearings of West or N.W. ¼ W., will lead a small vessel to either of the two reef-openings on the eastern face of the island, while Double Hill, in the southern portion of the island, bearing E.N.E., will likewise lead to a narrow channel through the reef on the S.W. coast opening into an inferior harbour.

Off the N.E. end of the island is a broad passage through the reef, leading to a safe and very fine harbour, suitable for large vessels; and, what is unusual, the passage is sufficiently wide for a vessel to beat out. This, however, would seldom be necessary, as there are several passages through the reef to the westward, which are safe with a leading wind. It affords shelter from the prevailing south-easters, and the approach to it may be found by bringing the summit of the island to bear S.W. ½ S., until its well-defined N.E. extremity bears S.S.E., which latter bearing, with a mast-head look-out for detached coral patches, will lead to an anchorage in 20 fathoms, coral bottom At the Observatory Rocks, near the N.E. point of Moala, it is high water, on full and change, at $5^h\ 50^m$; the rise and fall being 5 feet.

The island affords wood, water, and some provisions, and had 570 inhabitants in 1880, with two Europeans. It was once under the rule of the King of the Tonga Islands.

Tova Reef, or *Navatu*, the *only* danger in the vicinity, lies midway between Totoya and Vanua-Vatu (p. 684), being distant 23 miles N.E. by N. from the former. It is one of the most dangerous outlying reefs in the group; it is 3 miles in diameter, and nearly circular; Totoya and Moala are in sight from it, but Vanua-Vatu being low was not seen. At low water the reef is quite dry, and it then forms a snug basin, into which there is a shallow passage for boats. The soundings within the reef were found extremely irregular, varying from 2 to 16 fathoms. At high water the reef is entirely covered, and the sea breaks on it at all times. Its centre is in lat. 18° 39′ 31″ S., long. 179° 32′ W. High water, on full and change, at $6^h\ 8^m$; rise 4 ft., according to Captain Denham.

The natives state that a small coral head exists between Tova Reef and Vanua-Vatu, though H.M.S. *Alacrity* could not find it in or near its reported position, lat. 18° 32′ S., long. 179° 25′ 10″ W.

TOTOYA, or *Totoua*, was discovered by D'Urville, June 2, 1827. Its South end is in lat. 19° 0′ 15″ S., long. 179° 52′ W., and lies N.E. by E., distant 21 miles from Matuku It is of a circular form, 6 miles in diameter, and when

viewed from its peaks, presents a huge extinct crater, now full of ocean water of 30 fathoms depth, over a space of 3 miles diameter; the wash of the tide and swell on the southern side has reduced the rim to low-water level, while the ridge contains peaks nearly 1,200 ft. above the sea, surrounding this large, but, to a vessel, inaccessible basin. The island is surrounded by a barrier reef of triangular form, 22 miles in circuit, the elbows of which are 2 miles off the S.W., N.W., and eastern projections of the island.

There is a capacious ship entrance through the reef on the western side, which may be found by bringing the southernmost peak (1,159 ft.) to bear E. ¼ S., when it will be seen in the gap of the intervening ridge of land. Running for it, the foaming horns of the passage will show the fairway, which leads into a basin of smooth water to the southward, 2 miles long by 1 mile broad, perfectly sheltered, with good holding ground in 25 fathoms water. The shores of this roadstead are not adapted for watering, or seining; but wood, vegetables, poultry, and pigs are brought off by a most friendly people, who have warmly embraced Christianity. In 1880 they numbered 462, with one European.

It is high water at Totoya, on full and change, at $6^h\ 37^m$; springs rise 4⅛ feet.

MATUKU, or *Matugu*, another discovery of D'Urville's, is the southernmost of the central islands of the Fiji group. It was thought by the Exploring Expedition to exceed any of the other islands in beauty. Its face is broken into volcanic peaks, but has many fertile valleys. On its western side is what was named by the Expedition Carr's Harbour, which they state to be one of the best harbours in the group.

It was surveyed by Capt. Denham in 1856. He says:—At 66 miles S.E. by S. from Ngau Island, and in 19° 9′ 38″ S., and 179° 44′ 4″ E., is the southernmost of the Fiji group, with its summit 1,262 ft. above the sea. It lies North and South 4½ miles in length, and from 1½ to 3½ miles in breadth, bounded by a reef having a circuit of 16 miles, awash at low water, that projects 1 mile off the south-eastern and northern points of the island, but not more than half a mile from the general coast line. On the western side of the reef, with the central peak bearing East, is a channel one-eighth of a mile wide, with 30 fathoms water, and so clearly seen from the mast-head that I did not hesitate to take the *Herald* through it with the wind from S.S.E. It led into a basin having 16 fathoms water, with swinging room for two or three frigates, and a shore well adapted for coaling, if ever deemed desirable as a depôt for passing steamers. Wood, water, vegetables, poultry, and pigs can be obtained.

The population in 1856 was 600, Christianized under the Wesleyan Mission, and devoted to the British people; in 1880 it consisted of 710 natives and two Europeans. It was once subject to King George of Tongatabu. It is high water in Matuku Harbour, on full and change, at $6^h\ 18^m$; springs rise 5 feet

The ISLAND of VITI LEVU is the largest of the Fiji group, being about 85 miles in length East and West, by 57 miles in its greatest breadth. From the imperfect acquaintance with the natives of the group, it has been very variously denominated. Mariner calls it *Navihi-Levoo*, evidently the correct name in the Tonga dialect. On the charts it has been called *Ambow*, but this refers to the small though very powerful island at the eastern end, which, claiming much authority in the group, has caused its name to be so much extended. The name is *Viti* or *Vitchi*, corrupted into *Feejee*, *Fiji*, and the other names bestowed upon the group. The affix Levu means "great." Thus Viti Levu means Great Fiji.

The principal white settlements on Viti Levu are near Rewa, Suva being the capital of the group, also on the coast between Bau and Tova Peak, at Raki Raki on the North coast, Ba on the N.W. coast, Nandi on the West coast, and Navua River on the South coast. At Ndronga the natives have much interfered with the settlement. All the coast natives are civilized, but in the interior the people retain their old customs.

MBAU, Bau, or *Ambow*, a small island at the East end of Viti Levu, has risen to great importance from being the residence of Thakombau, who was chiefly instrumental in ceding the sovereignty of the Fiji Archipelago to the British crown. It is a small island, about a mile in circumference, and almost entirely occupied by the native town, which was estimated to contain a population of 1,500 in 1870. The houses, which are far better than in most Fijian towns, are crowded together without any regard to regularity, and produce a general appearance not unlike the poorer part of one of our West Indian towns. The population numbered 400 in 1877. No supplies can be obtained.

The whole bay in which Mbau lies is well sheltered by extensive coral sea reefs. *Mbau* is a singular-looking place. The approach to the town is much obstructed by reefs of coral, and the water being shallow, is impassable for an armed vessel. The island is connected with the main land or large island by a long flat of coral, which is fordable, even at high water, and is in places quite bare at low water. The towns of Viwa and Verata are within a short distance of Bau, and both have been its rivals. At each of these some fearful outrage has been perpetrated upon trading vessels.*

"Wilkes, in his examination of the Bay of Ambau, has placed within it various reefs and shoals; but the positions of many of these are erroneous, and there are very many existing which he has not shown at all. I am of opinion his plan of this bay is not intended as a correct survey of it; indeed, I do not conceive it possible that so extensive a sheet of water, bestrewed as it is with shoals, could be effectually surveyed in the time, and with the means he was

* The *Aimable Josephine* was cut off in July, 1864. In retaliation for this D'Urville destroyed the town of Viwa, in 1839. Another instance is cited by Capt. Worth.

enabled to command. His positions of the different islands and sea-reefs appear to me to be very faithfully placed."—*Capt. Worth.*

There is very good anchorage here or at Viwa to the North. The channel to the South of Ovalau is somewhat intricate from the island of Moturiki, but fit for ships of considerable draught. It is well known to some of the white men. Capt. Powell, R.N., says that the anchorage at Bau should be approached in the morning, and left in the afternoon, as the muddy water near the most difficult places requires the sun to be in a proper position to point out the reefs.

Caution must be observed in rounding the north-western extreme of the reef off Leleuvia Island, as a shoal patch lies off it. Low water is the best time for navigating the *Mbau Waters*, as the shoals are then more distinctly seen.

This extensive sheet of water is surrounded by a network of coral patches, some of which are partially dry at low water, while others never uncover, and all may be crossed by a boat at high tide. The outer sea reef, which is here 6 or 7 miles distant, most effectually breaks the ocean swell, while the numerous inner reefs prevent any sea getting up. *Rat Passage*, through the North end of the barrier reef, is only fit for boats.

From Mbau Roads it is about 12 or 14 miles to the town of Rewa; it is necessary to take high water to cross the many reef patches intervening between the roads and the mouth of the river.—*Capt. W. C. Hope, R.N.*, 1868.

Viwa is a small island of moderate height, containing about 400 acres, covered with bread-fruit and other useful trees, which supported a population of 170 in 1877. It has been made the head-quarters of the Wesleyan missionaries, from its proximity to Mbau.

H.M.S. *Pearl*, in 1874, reached Mbau Roads by Moturiki Channel, which is nearly 1½ mile wide South of Moturiki Island. Cagalai Islet, bearing N. 35° E., leads to the westward of the reefs which stretch S.W. by W. 1½ mile from Leleuvia Islet; and when clear a course S. by W. will lead to the entrance between the reefs at Mbau.

From the centre of the eastern and widest channel the West extreme of Leleuvia Islet will be seen just overlapping the East extreme of Cagalai Islet, bearing N. by E. ½ E. This channel is the one generally used, but there are apparently several other deep passages to the eastward, one of which the *Pearl* passed through, and obtained soundings of 6 to 12 fathoms.

Two small shoals were seen from aloft in the outer part of Mbau Roads, namely, one near the East side of the eastern channel, and the other just outside one of the central passages.

The islets of Tailau, Viwa, and Mbau may be seen at a distance of 6 miles, but are difficult to make out; bearings of these objects should be taken to determine the vessel's position. There is also a conspicuous red bluff, 60 ft. high, on the coast, near the North part of the Waters. The reefs are all covered, and in cloudy weather, or when the sun is ahead of the vessel, it is

difficult to distinguish them; under such circumstances it is better to anchor until the weather clears, or to engage the services of a local pilot. A stranger should on no account attempt to reach Mbau unless the reefs can be clearly made out from aloft.

There is anchorage in Mbau Roads in 5 fathoms, with Tailau Island bearing N.W. $\frac{3}{4}$ N.; the South extreme of Viwa Island W.S.W.; and Mbau Island S.S.W. Also in $4\frac{1}{2}$ fathoms, with Viwa S.W. by W. $\frac{3}{4}$ W.; and Tailau N.W. $\frac{1}{2}$ N.

The inner part of Mbau Roads is apparently filling up with mud.

Mumbualau Island, half a mile within the edge of the barrier reef, and 8 miles East of Mbau, is about $2\frac{1}{4}$ cables long, and covered with cocoa-nut trees, rising to 90 ft. above the sea. It is a valuable mark, as the coast hereabout is low. Between it and Mbau is *Tomberua Islet*, also covered with cocoa-nut trees. About 2 miles S. by W. of Mumbualau is the entrance of *Tomberua Passage*, leading into Mbau Waters, and fit for vessels of 11 ft. draught. *Kamba Point* is the northern extremity of a long narrow peninsula on the S.W. side of Tomberua Passage; it is surmounted by palm trees rising 160 ft. above the sea.

REWA RIVER.—*Wai-levu* (Great Water) *River*, the largest river of the Fiji group, was penetrated by Capt. Bethune, of H.M.S. *Conway*, for a distance of about 30 miles; Wilkes's party reached a few miles farther. It was ascended to its source by Mr. Macdonald, surgeon to H.M.S. *Herald*, with Mr. Waterhouse, in 1856. They have given a very interesting account of it in the Journal of the Royal Geographical Society, vol. xxvii. The mountain district is at about 36 miles from the mouth; at the latter it is low and flat. The country through which it passes is thickly populated and well cultivated. In 1870 there were thirty plantations on the river, and sixty or seventy settlers, since which time they have both much increased in number. On either side of the river are extensive flats of deep black loam, very suitable for plantations of sugar and root crops. The native population, although many in number, is rapidly dying out.

The Nuvuloa or Kambia branch of this river, which debouches $3\frac{1}{2}$ miles to the southward of Mbau Island, was ascended by a party from the *Pearl*, under Commodore Goodenough, in January, 1873. They proceeded as far as Nai-ruku-ruku (the double entrance), a distance of 47 miles from the mouth of the river, the journey and return occupying five days. With the exception of one day's rain fine weather was experienced. The river was swollen with rain, and a strong current prevailed; no tide was felt above the village of Navuso.

In the delta of the Rewa the Kambia is about 3 cables wide; from the delta to Navuso village, $1\frac{1}{2}$ cable wide. The river is navigable for ships' boats

having steam power as far as Vunidrala village, 44 miles from the entrance, and many miles further for rafts.

The Wai-ni-mala branch of the river, which falls into Rewa River near Vunidrala village, is very shallow, full of rapids, and only fit for small boats for 3 miles from this place or to Na-roro-vatu.

The *Nasalai* mouth of the River Rewa has good anchorage, protected from all winds, at Port Nasalai, in 8 fathoms, sand, about two-thirds of a mile S.W. of *Stone-on-reef* or *Na Vunivatu*, a rock 5 ft. above high water, on the South side of the entrance. This rock lies about 8 miles S. by W. ½ W. from Mumbualau Island.

Rewa Roads afford an open anchorage at the Nasoata mouth of the river, where small vessels can obtain protection from the ordinary trade wind under the point of the reef South of Nasoata Island, but in selecting a good position for anchoring, it should be borne in mind, that the reefs are very difficult to see, especially after rain, on account of the muddy water produced by the river. With strong trade winds, or during the hurricane months, this anchorage must be considered as too exposed.—*Lieut. W. U. Moore, H.M.S. Alacrity*, 1877.

Belcher Rocks are a group of sunken coral heads at the West extreme of Rewa Roads. The sea breaks on them only in strong winds. The East end of the bank bears E. ¼ S., distant 1¾ mile from Mokaluva or Mukalau Island.

The Harbour of Rewa, or *Port Nukulau*, is formed by two small islands, called *Nukulau* and *Mukalau*, with their attached coral reefs, and has three passages into it. The two southern ones, between and westward of the islands, are safe, though narrow, but the northern one is much obstructed by coral lumps, on one of which H.M.S. *Sulphur* struck in entering. The port is a secure one, and the anchorage in 7 to 12 fathoms, sand and mud, which is off the Island of Nukulau, is about 3 miles from the mouth of Wai-levu or Peale River, and 6 miles from the town of Rewa, which is situated on a low piece of land, which the river, passing on each side of it, has formed into an island. Sailing vessels cannot leave Port Nukulau until the trade wind veers to the northward of East; H.M.S. *Alacrity* was wind-bound here for ten days. There is easy communication with Lauthala Bay, between the coral reefs dividing these two anchorages.

Nukulau is a low, sandy island, well covered with wood. On the eastern side it has an extensive coral reef; but the western side is clear, and may be approached closely. There is a pool of water on the island, but no one could water a ship there without risk of causing sickness on board. The island belonged to Mr. Williams, late American Consul, and it was the destruction of his property in 1849 by fire which caused the claim of £9,000 to be made by the U.S. Government. The collecting of this claim being entrusted to Thakombau, first raised him above the other chiefs in importance. It is the first place where Sea Island cotton was grown in 1861.

Sir Edward Belcher says:—"The *town of Rewa* is about 6 miles up the river from the anchorage, and 2 miles from the mouth of the river. It is only to be approached by boats, which are "punted" up, on account of sand-banks having not more than 3 ft. water on them; the rollers also sometimes cause a ducking on them. The town, about half a mile from the bank, consists of houses built with posts, about 7 ft. high, with very lofty pitched roofs, thatched, and having an ornamented pole across the summit.

"The anchorage at Nukulau is safe, as well as convenient. Two safe and easy passages lead into it, and, with the assistance of the chart, vessels can enter at all times without a pilot. The eastern channel, by which the *Sulphur* entered, is also safe, if assisted by the chart and a boat ahead. The best anchorage is in 12 fathoms, with the outer island barely shut in with Nukulau, about 2 cables' lengths from the shore, on a muddy bottom. The strongest breezes blow from South to S.W. Water can be had at Nukulau, or by sending up the river. The *Sulphur* watered at the island.

"There are two entrances to this anchorage; one, the South passage, leaving the two small islets on the starboard hand; the other, the eastern passage through the reef, more to the eastward, passing between the two islets, and hauling round the northern one. The best anchorage is with the two islets in one, in about 10 fathoms. Farther to the East there are some awkward patches, not always visible.

"For quitting the anchorage, the best passage is the southern one; you can, however, pass inside the reefs and get through the eastern one, having taken the precaution of putting canoes on bad spots. A remarkable hummock to the westward, on with the North passage islets, leads into the East passage clear of a patch.

"Among these reefs a good look-out from the mast-head is the surest guide. The flood tide appears to set to the westward within the reefs.

"During the summer months there is a breeze off the land in the morning. In August we thought that we perceived that the trade wind was more easterly in the morning.

"The southern passage possesses the advantage of the weather point of the reef projecting more to the sea than the lee one, thus preserving the water smooth in the passage. To communicate with the town, if there be any surf on the bar of the river, which generally breaks, I recommend taking the channel West of the point. To get water you must send as far as the town, occasionally farther, filling from the river. Attend to the tide about crossing the bar; once I got three turns during the day, usually only two. There is not much wood in the neighbourhood, the banks of the river being chiefly mangrove."

SUVA.—At 10 miles West of Rewa Roads is Suva Harbour, an excellent one, within the reefs westward of Suva Point, forming a basin of about 1½ mile in breadth North and South, and 3 miles in length. It is moderately free

from shoals, well sheltered, and with good holding ground, easy of ingress and egress, with an abundance of wood and water. The entrance to it through the reef is narrow, 3 cables across, and deep.

Suva has been selected to supersede Levuka as the capital of the Fiji group, and as soon as the new government buildings are completed, the officials will be transferred to this place. The settlement is just northward of Suva Point; several stores and other buildings have been erected, but the population in 1883 was only about 200. The shallow part of the harbour, near the site of the future town, is being reclaimed for building purposes. *Coal* can be procured here from a hulk moored in 10 fathoms, $3\frac{1}{4}$ cables W. $\frac{1}{2}$ N. from Na Mbukalou store.

The following is principally taken from directions drawn up by Lieut. Hoskyn, H.M.S. *Pearl*, 1874, with which our later information is incorporated.

There is a round crested island near the western shore northward of Park Point. Shoal water extends from the western sea reefs, the N.E. extremity of which is marked by a *black buoy*, towards Park Point, and encircles the round island, extending thence to the next point at the head of the bay.

Suva Point is low, and cannot be seen from the anchorage. *Wai Lami Spit*, a ledge of rocks dry at low water springs, extends 6 cables off Factory Point, a low cliffy point about the middle of the northern shore of the harbour, and has a *black buoy* on its extremity, at 6 cables S.W. $\frac{3}{4}$ W. from the point. A spit which extends N.N.E. from the eastern sea reef seldom shows even from the mast-head, on account of the discoloured water discharged by the three rivers into the harbour. Caution is therefore necessary in rounding the spit. Two *white buoys* are moored on its North end. The 2-fathoms sand-bank, which lies about a mile westward of Na Mbukalou storehouse, and a quarter of a mile eastward of the spit, is also marked by a *white buoy*, but the buoys cannot always be depended on. To the southward of this are several other detached patches off the sea reef.

The small island of Namuka, which is about 3 miles to the S.W. of Park Point, is visible from a distance of 10 miles, and indicates the entrance to Suva Harbour. The factory on Factory Point can also be seen at a distance of 10 or 11 miles. A peculiar yam-shaped mountain stands a little West of the entrance; and inland, farther to the westward, there is a high mountain, with three pointed peaks or paps. *Na Komba Levu*, a dark-coloured mountain, 1,446 ft. high, is the S.E. peak of Viti Levu; it is a useful mark on this part of the coast, and bearing North will lead to the entrance of the harbour.

Lights.—On the North shore of the harbour are two conspicuous square white wooden beacons, 1,900 yards apart, which, kept in line bearing North, lead into the harbour. By night a *fixed red* light, elevated 30 ft. and visible 5 miles, is shown on the southern beacon on the beach, at $2\frac{1}{2}$ cables eastward of Nukumaroreko Islet; and on the upper beacon a *fixed bright* light is shown,

elevated 320 ft. and visible 10 miles. The latter light is not visible eastward of the bearing N.W. The lights are of a temporary character. A *fixed red* lantern light, elevated 25 ft., is shown from a pole placed close to high-water mark, 2 cables North of Na Mbukalou; it is obscured southward of a line passing 50 yards North of the easternmost of the two white buoys within the harbour entrance; also obscured northward of a line passing 50 yards South of the black buoy marking Wai Lami Spit.

To enter, bring Mbengha Island to bear about S.W. by S., and then steer N.E. by N., which course will lead up to the entrance. The passage between the reefs is about 3 cables wide, clear of dangers, and will be passed in mid-channel by steering with the beacons in line, bearing North, until a large white store-house at Na Mbukalou, with a flagstaff in front, bears E. by S., then steer for the store-house. The latter course leads between the spit extending from the eastern reef and Wai Lami Spit extending off the northern shore of the harbour, and thence to the anchorage. By night the red light at Na Mbukalou kept in sight will lead safely to the anchorage. From the entrance the store-house is hidden by an intervening point, which bears E. by N. $\frac{1}{4}$ N., but shows soon after passing the outer reefs. By steering the above courses, soundings of not less than 10 fathoms were obtained.

The anchorage in Suva Bay is good, and easy of access, and there is room for several vessels in 8 to 15 fathoms water. The *Pearl* anchored in 10 fathoms, with the flagstaff bearing S.E. by E. $\frac{1}{2}$ E., and the left extreme of Mbengha Island S.W. by S. Inside of this position the water shoals rapidly, but farther to the southward, off the factory bluff, a berth in 7 or 8 fathoms, soft mud, can be obtained. There is also said to be good anchorage in an inner harbour, near the round crested island which is situated northward of Park Point; and in *Na Walou Creek*, northward of the store-house, there is accommodation for vessels drawing 5 feet.

It is high water, on full and change, in Suva Harbour, at $6^h\ 30^m$; springs rise $4\frac{1}{2}$ to $5\frac{3}{4}$ ft., neaps 3 to $3\frac{3}{4}$ feet.

Lauthala Harbour, 3 miles East of Suva Harbour, and separated from it by Suva Point, is a convenient anchorage for vessels shipping sugar from the River Rewa plantations. It is about 2 miles long by 2 miles broad, and has good clear holding ground in from 3 to 12 fathoms, muddy bottom, well protected by the barrier coral reef, which dries at a quarter ebb. A narrow channel within the reefs, connects it with Suva Harbour; the entrance from sea is called *Nuku Mbutho*, and is 250 yards broad, $2\frac{1}{2}$ miles westward of Nukulau Passage.

Namuka Island, situated 3 miles to the S.W. of the entrance of Suva Harbour, and inside the shore reef, is small, and covered with trees. To the S. by E. of the island is an opening through the reef, having deep water, and leading to Namuka Harbour, which is said to have been formerly used by whaling vessels. A small river empties into the harbour, at the head of which

there is a village, and a saw-mill. From hence the shore of Viti Levu trends to the S.W. with off-lying barrier reefs, between which there are several entrances, leading to anchorages within the reefs, as shown on the chart. Off the southernmost part of the coast lies an extensive barrier reef enclosing the *Mbengha Lagoon*, in which are the islands of Mbengha and Yanutha, with numerous reefs and sunken dangers.

The Mbengha Barrier is a long unbroken stretch of coral reef, 21 miles in length, and varying in breadth from half a mile to 1¼ mile, situated to the South and S.W. of Mbengha Island, and having a prominent elbow at 12¼ miles S.W. ¾ S. of the highest peak. It is dry at low water, and breaks heavily only on this elbow. Caution, therefore, is required in approaching it at night, or in thick weather. *Nanuku Reefs* are a continuation of the Mbengha Barrier as it trends North, and afford protection to the island from the easterly swell. There are passages through Nanuku Reefs, and between them and Pratt Reefs, which can be navigated with the ordinary precaution of a good mast-head look-out. *Storm Islet* is a small sand kay, near the N.W. extremity of the largest of the Nanuku Reefs, covered with bushes, cocoa-nut and other trees, making its entire height 50 ft. The North point of Storm Islet is 3 miles N.E. by N. ¾ N. of Mbengha Peak.

From Pratt Reefs to the westward there are several detached patches and shoal ground, best understood from the chart. At 6 miles distant are *Nisithi Rocks*, 6 to 12 ft. below water, and on the reef at their southern end is *Bird Islet*, 4 ft. high, with some bushes on it. Thence to the westward and S.W. of Yanutha the *Yanutha Reefs* extend towards the western end of the Mbengha Barrier. *Frigate Passage*, at the South end of Yanutha Reefs, is 1½ mide wide, with two coral patches in it, and is available for vessels of any size.

Mbengha, or *Bega*, the largest, like all the large islands of the group, is basaltic, and of beautiful appearance, being well wooded. Its shape is oval, 5 miles long by 3 miles wide. It rises on all sides into several very prominent peaks, the highest rising to 1,430 ft. On its N.E. side is *Malumu* or *Sawau Harbour*, 2 miles deep and from a quarter to half a mile wide. It has good anchorage in 4 to 10 fathoms, mud. On the West side of the island is *Kovanga Bay*, called by Wilkes *Elliott's Harbour;* this is not so deep as the former, but more open at the entrance, and is surrounded by equally high land. On the North side of the entrance is a white sand beach, and a neat village of about thirty huts. Baffling winds make these harbours unsuitable for sailing vessels. There are two small islands near Mbengha; one at 1⅓ mile to the S.W., named *Stuart*, and the other close off its South side, called *Moturiki* or *Elizabeth*. The natives of Mbengha, numbering 750 in 1879, were found to be civil, and brought bread-fruit, yams, &c., to trade.

Vessels can anchor anywhere round the coast of Mbengha; but the water is deep, and the bottom rocky and uneven. When at anchor between Storm

Islet and Mbengha, in July, 1877, the *Alacrity* found the flood tide setting to the S.E., and the ebb to the N.W.

Yanutha is within the same reef as Mbengha, from which it is distant 5½ miles to W. by S. It is a mile in length, and has three peaks, the highest rising to 450 ft. The natives, about 150 in number, were very friendly. The reef on the N.W. side was found to contain many ship passages. At 1½ mile to the North of it is *Bird Island*, and the reef off this part of Viti Levu nearly joins that of Mbengha, but the channel separating them is very deep. There is anchorage in 7 fathoms off the N.W. coast of Yanutha.

VATU-LELE, which lies to the South of Viti Levu, and 26 miles W.S.W. of Mbengha, was discovered by D'Urville, June 7, 1827. It has the appearance of a raised coral island, but is of volcanic formation, 6¾ miles long N.N.W. and S.S.E., and three-quarters to 2½ miles in breadth. The North part is about 110 ft. high, and it gradually descends to a low point at its southern end. There is no more than a narrow shore reef on its western side, but on the northern and eastern shores a reef extends off 2 or 3 miles, forming a kind of bow from the South to the North end of the island, but it has no opening except for small vessels. Near its North end it encloses three small islets, the two western ones having palms on them. Vatu-Lele is well covered with wood, and had 320 inhabitants in 1880. Sweet potatoes and yams can be obtained in small quantities, but no good water.

The depth in the lagoon is from 3 to 4 fathoms, but scattered rocks make it unsafe for vessels drawing 10 ft., at low water. There are two narrow passages into it, named the *Weather* and *Lee Passages*, but a favourable sun and good look-out are necessary in using them, to avoid sunken patches. The Weather Passage, 2 cables westward of a conspicuous boulder, 1 foot above high water, is suitable for the entry of sailing vessels with the wind between S.E. and E.N.E. It is 80 yards broad at the mouth, and forks at a distance of 150 yards from the outer horns, the northern branch of the fork being safer, and vessels of 10 ft. draught may enter at low water. No attempt should be made to enter with the ebb tide. The courses through are S.S.W. and S.W. The Lee Passage is the best for the exit of sailing vessels in the trade wind season, if the wind is South of E.N.E., and is safe for steam-vessels, drawing not more than 10 ft., at any time of tide. It passes 500 yards East of the western islet, and is divided into two channels, some few hundred yards from the entrance, by a group of rocks. The eastern channel is safest.

During the stay of H.M.S. *Alacrity* in the North part of the lagoon, the flood set S.S.E. and the ebb N.N.W.

At 8 miles E. by N. from the South point of Vatu-Lele is *Thakau Lekaleka*, a dangerous coral reef, awash at low water, and half a mile in diameter. Wilkes calls it the *Flying Fish Shoal*, though it is not improbable but that it is the same made by D'Urville in approaching Vatu-Lele. It generally breaks heavily.

About midway between Mbengha and Kandavu, Capt. Denham obtained a deep-sea sounding of 1,020 fathoms, bringing up bottom, which was found to consist of minute animals, similar to those found in the bed of the Atlantic and elsewhere.

The South Coast of Viti Levu, westward of Suva, is mountainous and densely wooded. *Koro Mbasa-mbasanga Peak*, 18 miles W.N.W. of Suva Harbour, is 3,960 ft. high, the highest of six summits, and conspicuous from sea in clear weather. This part of the country is, however, wet and misty. *Delai Mau*, 11 miles W.S.W. of Suva, is a conspicuous wooded peak, 620 ft. high. At 2 miles westward of it is the native town of *Vei Vatuloa*.

About 2 miles north-eastward of the entrance to Navua River, there is good holding ground in sand and mud, inside the western spit, but it is of small extent. It is entered by *Tongoro Passage*, which will be found by bringing the East extreme of Mbengha to bear about South. Keep midway between the reefs, until the vessel is inside a spit which extends a quarter of a mile N.E. from Navua Reef; then steer to the westward, and anchor in 6 fathoms with the East extreme of Mbengha Island bearing S. $\frac{1}{2}$ E., and the break on the western reef, S.E. by E.

Navua Point is low, and covered with mangrove bushes; the entrance to *Navua River* is just to the westward of it; and vessels will find anchorage in *Navua Roads*, in 4 fathoms, with westerly winds, sheltered by *Rovondrau Reefs* to the S.W. of the river. The river is navigable for boats 4 or 5 miles from its mouth. At $1\frac{3}{4}$ mile S.W. by W. is the mouth of *Deumba River*, a tidal stream which joins the Navua at 4 or 5 miles from its mouth. The country hereabout is very fertile, and several Europeans own property here. Deumba River debouches into *Rovondrau Bay*, where there is good anchorage, sheltered by the reefs from S.E. winds. Near the S.W. end of the reefs is a kay about 1 ft. above high water.

The channel between Mbengha Island and Navua Reefs is 10 miles long and about a mile wide in its narrowest part, and appears to be clear of dangers; though several tide rips and much discoloured water were observed in the channel when the *Pearl* passed through, yet no soundings were obtained with the hand lead, the least depth in mid-channel being about 140 fathoms. At high tide the water breaks on some of the northernmost of the Mbengha reefs, but Pearl Rock and Cæsar Rocks do not break. The position of the shore reefs can only be known by a slight ripple, so that a good mast-head look-out is necessary.

Between Navua and Serua, which is 13 miles to the westward of it, the shore reefs extend 2 to $2\frac{1}{2}$ miles from the coast, with a passage inside them, used by small vessels. About halfway is the *Shark's Fin*, an isolated hill near the shore; it is 680 ft. high, and covered with trees. At $2\frac{1}{2}$ miles southward of it is *Shark Reef*, on which is a sand kay, 1 ft. above high water.

Red Bluff is situated 23 miles W. by S. from Navua, and 7 miles from

Granby Harbour. The coast thence continues high for about 12 miles to the westward, and then becomes gradually lower for 6 miles, till near some conspicuous sand-hills which slope down to the sea, terminating in a point about 80 ft. high, near Singatoke River. To the westward of Red Bluff the trees are scarce compared with those on the East and part of the North sides of Viti Levu, where the foliage is dense, and in the first-mentioned part grass and scrub prevail, except in some of the valleys and lower land where there are some trees.

Sarua Harbour.—The island in Sarua or Serua Harbour, which is composed of two hills of moderate height, with a low gap between, and having a large native village on it, will be seen clear of the mainland, when approaching from the westward. On the East side of the reef extending from the island there is a narrow opening in the reef leading into Sarua Harbour, which is sheltered by the sea reefs, and affords good anchorage in 15 fathoms, with the low gap in the island bearing W. ½ N., distant about 6 cables. Westward of this are some sunken rocks. As the direction of the entrance is N.N.W. and S.S.E., sailing vessels are liable to be wind-bound here. There are some sunken rocks on each side of the entrance, from which the West peak of Yanutha Island bears S.E. ½ S., distant 6 miles. No supplies can be obtained here, except water.

At 1½ mile N.W. by ½ W. of Serua Island is the *Hogsback*, a conspicuous round wooded hill, 800 ft. high. At 3½ miles W. by S. of Serua Island is the narrow entrance of *Vuna Nui* or *Granby Harbour*, in which there is sheltered anchorage for steam-vessels in 8 fathoms, mud. From hence the coast continues to W. ½ N., fronted by a fringing reef from 300 yards to a mile distant, with numerous boat channels. There are several conspicuous peaks near the shore. At 10 miles W. by N. of Hogsback Point is the small native town of *Koro Levu*, which may be said to be on the boundary between the wet and dry climates of Viti Levu. At 7¾ miles farther is *Sovi Harbour*, in which steam-vessels can anchor in 7 fathoms, sand.

Singatoke or *Siga Toka River* rises near the centre of Viti Levu, and enters the sea at 16 miles W. by N. from the Red Bluff; the water is much discoloured for a considerable distance from the mouth of the river, and has the appearance of shoal ground, particularly when the sun shines on it. It is situated at the East end of the sand-hills, and is navigable for boats for some miles, but can only be entered at high water in fine weather. For 2½ miles West of the entrance there are no fringing reefs, but sand-hills, 20 to 190 ft. high, line the shore.

Thuvu or Ndronga Harbour lies 6 miles W. by N. from the entrance of Singatoke River. Inside the shore reefs on either side of the harbour are two small islands, Kaba and Ya-nu-ca, by which the harbour may be known. *Kaba Island*, which is on the western side of the harbour, is from 40 to 60 ft.

high, thickly wooded, and has a lagoon on its South side surrounded by swampy ground, where wild duck are found. *Ya-nu-ca* or *Yanutha Island*, on the East side, is from 60 to 70 ft. high, and thickly wooded at the South part; a long, low, sandy point extends from its North side, on which there is a large number of cocoa-nut trees. At the head of the harbour there are several large trees, inside the mangrove bushes which line the beach just above the water line. The beach is steep, and heavy rollers generally set upon it; landing in boats is therefore difficult. The best landing places are at the East and West extremes of the beach, or, when the tide is sufficiently high, in the creeks. There is also good landing on Ya-nu-ca.

At low water a part of the reefs is exposed, and several small rocks and stones show above water. There are heavy breakers on both sides of the entrance, particularly on the western reefs.

The fairway course between the reefs is N. 1° E. A dangerous coral spit, having 9 to 15 ft. water, which breaks at low tide, extends to the eastward from the elbow of the western reef into the channel, contracting it to 2 cables. The eastern reefs are steep-to. The water shoals gradually from 15 fathoms a short distance inside the reef to the anchorage in 5 and 6 fathoms, but farther in the soundings quickly decrease to 4 and 3 fathoms.

With on-shore winds heavy rollers set in. The bottom is hard sand, and the outer reefs afford but little protection. The *Pearl* anchored in 5 fathoms, with the extremes of Kaba Island bearing S.W. by W. and W.N.W.; and Cuvu Village E. by N.; but a better berth would be half a cable to the eastward. It is high water, on full and change, in Ndronga Harbour at 6^h; springs rise 5 to 6 feet.

Between Ndronga Harbour and *Songo Island*, 5 miles to W. ½ N., the coast is fringed by a reef extending from 1½ cable to a mile off. Songo Island lies on the S.E. side of *Na Tandola Harbour*, in which there is anchorage in 4 to 5 fathoms close to the island. *Koromba* or *Pickering Peak*, is a sharp peak, 3,550 ft. high, 17 miles N. by E. ¾ E. from Ndronga Harbour.

Likuri Island, 3½ miles N.W. ½ N. from Songo, is low and covered with cocoa-nut trees; to the westward of the island there is an opening in the reefs, leading to *Likuri Harbour*, which is found by bringing Koromba Peak to bear N.E. ½ E. This harbour is well sheltered from all winds and easy of egress, but sailing vessels will find entering difficult with the prevailing E.S.E. wind blowing. There is anchorage in 3 fathoms, sand and mud, at 3 cables westward of Likuri Island. It is high water, on full and change, at Likuri Island, at $6^h\ 30^m$; springs rise 4 ft., neaps range 3 ft. *Tuva River* discharges into this anchorage; boats can ascend the Tuva a distance of 6 miles at high water.

The route inside the Barrier Reefs, which surround the greater part of Viti Levu, may be safely taken in clear weather, when the sun is well above the horizon and astern; the vessel should be conned from the mast-head.

There are but few sharp turnings, and none that offer any difficulty to a small handy steam-vessel. In several places, however, on the South coast, there are barriers which prevent the passage of anything but boats at or near high water.

It is difficult to obtain the services of a pilot who has a thorough knowledge of the whole coast; there are many who know the pilotage of parts of the coasts, but as they are accustomed to small vessels only, and navigate entirely by the eye, too much confidence should not be placed in their abilities. The native pilots can generally point out with accuracy the shoals; the Lasakau, or fishermen of Mbau, are those who possess the greatest amount of general knowledge, but it will be necessary to take a new pilot for each part of the coast.

From Tuva River to *Uverite Point*, the western extremity of Viti Levu, the coast takes a N.W. direction for a distance of 6½ miles, and consists chiefly of mangrove. A fringing reef extends throughout for 1½ or 2 miles from the shore. Near the land there is a passage for boats and small craft, which connects Likuri Harbour with Nandi Waters. From Uverite Point to Navula Point the bearing is North, and the distance about 4 miles. On a stream at the head of the bay between these two points is the native town of *Momi*. Along this part of the coast is a coral fringe, and overlooking Navula Point is a double hill with two peaks, the highest of which is 760 ft. From Navula Point the coast runs for 2 miles in a N.N.E. direction, then trending to the eastward, and forming a bay 7½ miles long and 2½ miles in depth, into which flows the southern mouth of Nandi River, from which the coast runs N. ½ W. 3 miles to the South point of Nandi Bay.

The barrier reefs off the West coast of Viti Levu commence at Uverite Point, and extend to the N.W. for 34 miles. A space of 17 miles then intervenes, directly to leeward of Viti Levu, where there is no barrier. The only safe passages through the reefs to Nandi for sailing vessels are the Navula and Malolo Passages.

Navula Passage, 2¾ miles N.W. by W. of Uverite Point, is found by bringing Mount Evans in line with the North summit of Double Hill bearing N.E. The channel is about 1 mile in length, and half a mile wide in the narrowest part. From the *Pearl's* mast-head several small shoals of 6 to 12 ft. were seen off the eastern reef, some of them 50 yards from the breakers. A long shoal spit extends E.N.E. nearly half a cable from the inner edge of the western reef. The sea breaks heavily on the outer parts of the reefs. Several shoal patches inside the reefs mentioned were observed from the mast-head; and a break was seen at about a mile North of the eastern extremity of the western reef.

Malolo Passage, 4½ miles N.W. by N. of Navula Passage, is a very remarkable opening; it has for its portals two small islands, Namotu and Tavarua, of nearly the same size (named by Wilkes *Waldron* and *Spieden*,

after his pursers), between which the tide rushes with great strength. Namotu, on the N.W. side, has a group of cocoa-nut trees on it. The great sea reef appears to be broken asunder by some convulsion of nature, and the rushing tide has entirely swept away the fragments, leaving a fine open passage between the two islands of two-thirds of a mile in width. The passage lies N.E. and S.W., and ought not to be attempted by a sailing vessel with a contrary wind, or ebb tide, as there would not be room enough to beat through, except in a small vessel. It may be readily found by bringing Mount Evans to bear N.E. by E., and steering on that course until the islands are recognized.

From *Wilkes Passage*, a narrow channel between Namotu and the Malolo barrier reef, the latter trends 8½ miles to N.W. by W., and is awash at low water. *Mamanutha Reefs* lie N.W. of the Malolo barrier reef, and between them are numerous passages; the S.E. reef is awash at low water, but the remainder are sunken dangers with 6 to 30 ft. of water over them. Their edges are not well defined, and they break only in boisterous weather.

The safest passages through these reefs will be found with Malolo Island summit bearing E. ½ N. and E. by S., distant 7 and 10 miles respectively. Sailing vessels approaching Nandi Bay from outside the reefs should use either Malolo or Navula Passages.

NANDI BAY.—After clearing Malolo Passage, the course, if bound to Nandi Bay, inside the reefs, is towards *Mount Evans*, which is 3,940 ft. high, and lies 9 miles N.E. by E. of Nandi Bay. When Iakuilau Island, which is low and sandy, with a few cocoa-nut trees, comes in sight, steer towards it, and as soon as it is passed, a vessel should steer between the fringing reef of that island and the reefs eastward of a small breaking reef which lies about a mile N. ¾ E. from it. A small coral shoal lies just to the northward of the fringing reef of Iakuilau. No soundings were obtained as the *Pearl* passed through this narrow channel until nearly halfway through, when 7 fathoms was found; the soundings then gradually decreased to 4 fathoms on the mud flats off Nandi River. This is the best protected anchorage, but it can only be entered by daylight, and a sailing vessel should approach from Malolo Passage, as the wind is very uncertain and baffling by Navula Passage. However, when inside either of the entrances, there is good anchorage in 10 to 20 fathoms, as far as Nandi Bay.

Nandi Bay is about 5 miles in extent North and South by 4 miles in depth, and several tidal streams empty themselves into it. The depths in the bay are moderate, shoaling from 11 fathoms in the N.W. part, to 2½ and 3 fathoms about a mile from the shore in the S.E., the bottom being muddy, excellent holding ground. Off the mouth of Nandi River, in the South portion of the bay, are some low islands and detached coral patches, rendering a near approach to the shore hazardous in large sailing vessels. It is considered that a well appointed vessel could with safety ride out a gale, but the S.E. trade

wind occasionally raises sufficient sea to render landing difficult. This place has been visited by severe cyclones, therefore caution is necessary during the months in which bad weather may be expected (November to April). A vessel, of necessity at anchor in Nandi Bay, should be prepared for these storms, and, if possible, select a well-sheltered position south-eastward of Iakuilau Island.

Vessels may anchor off the plantation of Vunda, on the North part of the bay, in $3\frac{3}{4}$ fathoms, with the West extremity of Iakuilau Island bearing S.S.W. The soundings decrease gradually from 8 to 4 fathoms. Here fresh water may be procured in boats, at $1\frac{1}{2}$ mile from the mouth of Nandi River. From Vunda Point, the North point of Nandi Bay, to *Na Korokoro Point*, the general direction of the coast is N. by W. and the distance $2\frac{2}{3}$ miles, a narrow coral fringe bordering the coast.

Between *Tartar Reef*, at the North end of Mamanutha Reefs before described, and the South end of Viwa Reef, there are no known dangers, but within this line and the Mamanutha and Malolo barrier reefs, between and among the groups of islands there are numerous reefs and sunken dangers, making it unsafe for sailing vessels, as the wind is uncertain, and there are no anchorages except at Waia.

Malolo Island lies 7 miles off the western end of Viti Levu, and on the N.W. side of Nandi Waters. It obtained an undue notoriety from the proceedings of Capt. Wilkes, arising out of the massacre of two of his officers, Lieut. Underwood and Midshipman Henry, by the natives, July 24, 1840.

It consists of *Malolo* and *Malolo-Lailai*, or Little Malolo, separated by a narrow and rocky interval, with four other islets. The large island rises to a grassy peak, 750 ft. high, and on it are two villages, Sua Lib and Arro, the former on the S.W. side; these were destroyed by the American party in retribution for the murder of their associates. The inhabitants numbered about 300 in 1879. To the northward and N.E. of Malolo are several small islets, to which the name of *Underwood Group* was given; and upon *Henry* or *Kandavu Island*, a small sandy islet, one of the easternmost of the group, the two officers were buried.

To the N.E. of Malolo, and S.E. of that line, are many reefs, and several islets, which were named *Linthicum*, *Smith*, *Henry*, *Reynolds*, and *Bateman Islets*, all low, sandy, and wooded. *Vunda* is a sand-bank without trees. *Vanderford* is a little larger bank, with a small clump of trees on the North end. A reef having a stone showing above water lies S. 88° E. 7 miles from the North extremity of Malolo Island.

About 4 miles N.W. of Malolo is Mana Island, the southernmost of two groups extending thence 15 miles to the N.N.W., together, 13 in number, named *Mamanutha Islands*. D'Urville named the southern group *Chaptal Islands*, which Wilkes superseded by *Hudson Isles*, particularizing them by the names of the officers of the Expedition. *Monu Island*, near the northern end

of this group, has a remarkable thumb-peak westward of its summit, 750 ft. high. Tavua and Yanua are inhabited. *Na Vandra*, 420 ft. high, is the highest of the northern group, to the islands of which Capt. Wilkes gave names, but they had been previously named *Bitonho Islands* by D'Urville, of which he takes no notice. The northern group is uninhabited. *Waia Island* is described hereafter with the Yasawa Group.

On the coast of the main island, is a passage through the reef, named the *Ba Passage*. The town of *Ba* is 14 miles further on. The land close to the shore is low, but it gradually rises for 5 or 6 miles in hills from 500 to 700 ft. in height, and here and there through the breaks may be seen the distant blue mountains towering above them. The natives here speak a different dialect to those of the eastern district of Viti Levu. Ten miles further on is the town of *Dongaloa*, on the coast. The country in this vicinity so far changes its aspect that the high lands approach nearer the shore, and level ground is only to be seen in narrow and contracted valleys. The whole extent of coast does not appear to be thickly cultivated, though it is not without inhabitants.

Inner Channel—Passing to the northward from Nandi Bay, a berth of half a mile should be given to Vie Tonga Point; a course N.E. by N. should then be steered until the island to the northward of the point is approached, when the course will be N.N.E. A shoal lying N.N.W., 1¼ mile from Vie Tonga Point, is the south-eastern of a number of shoals extending as far as the eye could see from aloft; the sea was observed to break over many parts of this shoal ground, other parts appeared not to have more than 6 ft. water over them.

The first island North of Vie Tonga Point is skirted by a reef extending a quarter of a mile off shore. The passage here is about a mile wide. The supposed position of a shoal three-quarters of a mile N.N.E. from the last-mentioned island was passed over by the *Pearl*.

Ba Passage, used by the *Pearl*, is narrowed by the reefs extending off the two islands (Votia and one to the southward) which form the passage. The course through is E.N.E., with soundings of 5 to 7 fathoms; the shoals could be clearly seen from the mast-head. Off the point on the mainland South of Votia Island there are two small wooded islets, separated from the main land by a canoe passage; from seaward they appeared to form part of the point; the outer one bears South from Votia Island.

There is another passage about half a mile wide on the West side of Votia Island, which is fringed by a reef to a considerable extent.

After Ba Passage is cleared the course is N.N.E. till abreast of *Cilau Point*, off which a reef extends to the northward one-quarter of a mile, with a lump of stones showing above water 3 cables farther North. About a cable farther in the same direction is a dangerous patch, having apparently only 4 ft. water.

On the inner of the two Tabooa Reefs there is a sandy island named

Malebu, having stunted cocoa-nut trees. The ship channel is between Malebu Reefs and those extending off Cilau Point, and is very narrow at the turning point, but presents no difficulty to a steam-vessel or to a sailing one with a fair wind, provided the reefs can be seen from aloft. From Cilau Point to Ba there are so many sunken dangers that the channel should not be attempted unless the sun is in a position favourable for seeing the reefs. Anchorage can always be obtained off this part of the coast, but the anchorages on the North coast of Viti Levu are indifferent, and should be avoided during the hurricane season.

East of Ba Point a mud flat extends 2 to 3 miles off the shore; the lead is a sufficient guide in approaching the flat, but the water shoals quickly from 6 fathoms. Between the flats and the barrier reef there appeared to be no danger. After rounding the flats alter course for the anchorage off Ba River; when the entrance bears S. 1° E. steer for it and anchor in 6 fathoms with Dongaloa Island bearing N.E. by E. $\frac{3}{4}$ E. The water from the river reaches the anchorage at half ebb.

Two remarkable hummocks on the outer range of hills, on the West side of Viti Levu, bearing S. $\frac{1}{2}$ W., will lead to the entrance of Ba River, which is difficult to recognize from seaward. The river is only navigable for vessels of light draught.

Dongaloa consists of a reef, having a number of sand-banks on it awash at high water neaps, and extending much farther West than was formerly supposed. There are a few sunken patches near the South side of the reefs.

From the anchorage off Ba River steer off shore a little to clear the mud flats, and then steer to pass 2 cables South of Dongaloa Reefs. Off the third point to the eastward from Dongaloa a reef extends under water $1\frac{1}{2}$ cable. Between this point and Vatia Island there is a small island about 80 ft. high, covered with trees, and having a bight with shallow water to the westward. The channel between the mainland and the barrier reef is a half to $1\frac{1}{2}$ mile wide, and apparently clear of dangers.

Vatia Island, 600 ft. high, which, until close-to, appears like a part of the mainland, has a small boat passage South of it at half tide. A reef awash at low water extends North from the island. To the eastward of Vatia Island, between it and the long reef that extends off shore from Tavua River, there are a number of sunken patches. After rounding Tavua Reef, steer to the southward between the latter and the barrier reef for the anchorage off Tavua River. Anchor in 9 fathoms, with the mouth of the river bearing S. $\frac{1}{2}$ W., and about 1 mile from the nearest part of the shore.

The *Island of Malaki*, which lies adjoining to the northernmost point of Viti Levu, is 500 ft. high, and has the appearance of having been well cultivated at some former time. It is now owned by Europeans. On the top are the remains of a stone fortification. It is divided from the main island by a narrow strait, and off it is a passage through the sea reef. Some plantations

belonging principally to Americans are established on this part of the coast, which is named Raki-Raki.

Charybdis Reef.—When on the passage from Raki-Raki to Vanua Levu, H.M.S. *Charybdis*, in 1868, passed a coral reef not laid down on her charts. This reef, which is just awash, is between 2 and 3 miles in length, crescent-shaped, in a N.E. and S.W. direction. Its centre lies W. by N. $\frac{3}{4}$ N., about 7 miles from the North point of Annan Island, and about 9 miles N. by E. from the anchorage of Raki-Raki.

Inner Channel.—From Tavua anchorage steer towards the barrier reef and along its southern side, passing North of a large breaking reef, situated 2 miles N.E. of Tavua. The channel, which is continued to the northward of Malaki Island, and of the three small islands which lie to the westward of it, appears to be clear of hidden dangers, and vessels should keep midway between the outer reefs and those extending from these islands. The channel abreast Tovu-Leilei, the first island West of Malaki, is 2 cables wide, and from a distance this part of the passage appears to be almost blocked by the reef.

A little North of the fairway, abreast Malaki, there is a patch of about $2\frac{1}{2}$ or 3 fathoms depth, and a reef extends three-quarters of a cable from the North side of Malaki; the passage North of this island is $1\frac{1}{2}$ cable wide, being narrowed by numerous detached coral knolls near the South edge of the barrier reef. It is better to keep near the island reefs, as they are steep-to.

Malaki and its adjacent islands are wooded, and have a rich soil. From the mast-head of the *Pearl* no passage could be seen inside these islands.

There is anchorage off the West end of Nananu-ira Island in 11 fathoms, mud, good holding ground, with the South point of the island bearing S. 55° E.; the water shoals quickly inside this position. As there are several sunken reefs to the westward of the anchorage, a good look-out should be kept from aloft. There is also good anchorage off the West side of the easternmost Nananu Islands, sheltered from winds between N.N.E. and S.S.E.

From the anchorage at Nananu-ira the in-shore passage will lead to Nagilo-gilo Head, the southern point of Viti Levu Bay, but it is so studded with reefs that no written description could be of service, without local knowledge.

Viti Levu Bay is about 3 miles in diameter. On its shore is (or was in 1870), situated a weather-board house, set up here by the Polynesian Company, who afterwards abandoned their scheme of making plantations hereabout.

Coming from the southward it is considered that Nananu Passage might easily be made out by bringing Nagilo-gilo Head to bear S.E., and steering N.W. till the islands are approached. Off the centre of Viti Levu Bay there is a patch, having about 6 ft. water, which breaks during moderate breezes. The best passage is to the westward of the patch, as the ground is clear of dangers in-shore round the bay till close to the beach; when past the patch steer S.E. $\frac{1}{2}$ E. To seaward there are an immense number of reefs. There

are several bights in this part of the coast, with secure anchorage for small craft.

About 3 to 5 miles to the S.E. of Nagilo-gilo Head there is a small island skirted by a reef, pass just outside it; then bring the island in line with Nagilo-gilo Head bearing N.W., and steer S.E., which mark will lead clear of all dangers till about 2 miles from the fringing reef North of Tova Peak. Then haul out so as to clear the reef, and round it at about 3 cables distant. Steer E.S.E. until Tova Peak, a double peak 2,095 ft. high, bears W.S.W., when the course can be altered for the North part of Ovalau Island bearing about E. ½ S., passing through a labyrinth of shoals. Pass to the southward of *Naingani Island*, which lies 5½ miles N.W. of Ovalau, and is a mile in length, rising to 600 ft. in height. Off its South side a reef extends 1½ cable to the southward, and two shoals lie three-quarters of a mile to the westward of it. Between it and the coast are many shallow patches.

From Nananu-ira the N.E. extreme of the outer reefs bears E. by N. distant 8 miles, and here it turns to the S.E. by S., till off Tova Peak, at 5 miles N.N.E. of which is the southern end of an extensive barrier reef, 15 miles long N.N.W. and S.S.E. and 2 to 5 miles in breadth, through which there are many passages to the lagoon within. The channel between the northern end of this reef and the reef off Vanua Levu is 2½ miles wide, and is named *Vatu-ira*, from a small islet 100 ft. high, 2½ miles within the North end of the detached barrier reef.

The ISLAND of OVALAU ("*Obalauo*," Sir Edward Belcher), is 8 miles in length, North and South, by 7 miles in breadth, East and West; it is of volcanic formation, and its rocks are composed of a conglomerate or pudding-stone; it is high and rugged throughout. The valleys only extend a short distance into the interior, and leave but little level ground; they are, however, exceedingly fertile and well cultivated. Its harbours are all formed by reefs; that of Levuka, on its East side, is safe, has good holding ground, and is easy of access, where vessels can always procure wood and water. Ovalau is, at present, the principal residence of the white men of the group. It has always been the favourite residence of the whites, from its central position with regard to the remainder of the group. Though it is not a productive island, the East side being all barren rocks, and the natives more indolent than they are in other parts of the Archipelago, nevertheless there is a resident missionary and schoolmaster, an English, American, and Hawaiian consul, and a good number of merchants. The native population of Ovalau has much decreased; in 1880 they numbered 2,130, the Europeans numbering 1,050. In 1870 there were fifteen native towns, and a good many half-castes are found on the island. As a cotton growing district, Ovalau is not suitable; there are, however, a few plantations on the western side of the island.

LEVUKA is situated in a quiet and peaceful valley, surrounded by a dense

grove of cocoa-nut and bread-fruit trees, with a fine stream of fresh and pure water running through it to the beach; high, broken, volcanic peaks rise to the West, forming the background. The Peak of Andulang is estimated to be 2,070 ft. high; the highest, *Dille-Ovalau*, being about 200 ft. higher. From the summits the fantastic needle-shaped peaks of Vanua Levu, are distinctly seen, though 60 miles distant.

The importance of the town of Levuka arose owing to the friendliness shown to the whites by the chief Tui Levuka, who died in the year 1870. As the site of the (at present) most important town in Fiji, it is most unsuitable, being built on a narrow strip of beach, which it now fully occupies with a double row of houses three-quarters of a mile in length. It is incapable of further extension. In 1880 it contained a population of 1,000 whites. There are several hotels and public buildings, and the principal wharf, at the South end of the town, is carried out into a depth of 6 fathoms, alongside which the mail steamers lie. There is a patent slip on Levuka Point, only adapted for small craft. At *Nasova*, southward of Levuka, are the government buildings, but Suva on the South coast of Viti Levu is now the capital of the group. A good trade is carried on with Australia and New Zealand. Supplies are sometimes scanty and dear, but water can be obtained from a pipe at the watering jetty at 4*s*. a ton, or from the stream.

The Harbour of Levuka, says Capt. Worth, is decidedly the most convenient anchorage in the Fiji group, being more central than any other, with its entrances so clear and attainable, that no accident can happen with common caution; added to which, it is the only harbour where water can be easily obtained, a fine stream of which runs into it from the mountains abreast the anchorage, and from which it can be rafted off with great expedition and facility. The anchorage is entirely sheltered by a reef which runs nearly parallel with the shore, distant from it nearly half a mile, and which keeps the water nearly always smooth.

Harbour lights, of a temporary character, have been established at Levuka. The lights are *fixed;* the inner light *bright*, elevated 240 ft, and visible 10 miles, is placed on a hill behind the town, and the outer one *red*, elevated 193 ft. and visible 2 to 4 miles, a little to the South of the Wesleyan mission-house. The beacons from which the lights are exhibited are painted white, each with a red diamond. The lights by night, and the beacons by day, in line, lead through the middle of the South entrance passage into the harbour. They are E. $\frac{1}{4}$ N. and W. $\frac{1}{4}$ S., 73 yards apart. A *fixed green* light, elevated 14 ft. and visible 14 miles, was shown on the end of the wharf North of Naquima Point.

There are two entrances into Levuka Harbour. The southern one, 330 yards wide, is the one principally used, and on the Mbalavu Reef on its South side is an iron *beacon*, coloured red and surmounted by a cage, 70 yards inside the shoal water. The North or Waitovu entrance is 4 cables wide, and is

much used by sailing vessels leaving Levuka with an East wind, there being room to work out, and a fair depth for anchoring.

A 3-fathoms shoal is said to lie in the middle of the North channel, and a 9-ft. rock, at $1\frac{1}{4}$ cable S.E. $\frac{3}{4}$ S. from the northern reef, is marked by a *chequered black* and *white* buoy The shoal water extending off the southern reef is also marked by a buoy or buoys, off its northern extremity. No dependence, however, can be placed on these buoys, as they are small and often out of position.

There are several coral patches in the harbour; *Ithi Thambi* or *Half-tide Rock* is the principal, and lies 2 cables East of Niukambi or Observation Point, a 9-ft. patch lying between. This rock dries at low water, and has on its centre an iron perch with a ball. A *black* and *white chquered buoy* marks a 10-ft. patch, $2\frac{1}{2}$ cables S.E. by E. from Observation Point, and a $3\frac{3}{4}$-fathoms patch has been found at $6\frac{2}{3}$ cables S.E. $\frac{1}{8}$ S. from the same point. The beacon on Half-tide Rock in line with the right extreme of Ovalau, N.W. by N. $\frac{1}{2}$ N., leads clear of the foul ground off Nasova. Off Waitovu, nearly opposite the North entrance, are several shallow coral patches, about 1 cable from the shore.

The usual berth for a man-of-war is in the North anchorage in 16 to 17 fathoms, sand and mud, with the beacon on Half-tide Rock S.W. by S., and Mbalavu perch S.E. by E. The South anchorage, frequented by merchant vessels, is in 10 to 15 fathoms, sand, coral, and mud, to the southward of Half-tide Rock perch.

It is high water, on full and change, in Levuka Harbour, at 6^h; springs rise 5 ft., neaps $2\frac{1}{2}$ ft. The tide is only slightly felt at the anchorages, but runs swiftly in the entrances.

Boats can safely pass within the reefs between Ovalau and Suva, making use of the branches of the Rewa River, between Mbau and Lauthala Bay.

Vessels navigating between Levuka and the Makongai Passage should give a wide berth to the N.E. horn of the Ovalau barrier reef, which breaks very lightly, and is consequently difficult to see at night. The horn bears about 7 miles North from Levuka.

Some $2\frac{1}{2}$-fathoms rocks were found by H.M.S. *Nymphe*, $1\frac{3}{4}$ cable off the North end of Ovalau, from which the North point of Ovalau bears E. by N., and the centre of Tumuna Peak S.S.E.

A *coral patch* has been discovered off the rivulet Mbu-re-ta, bearing W. by S. $\frac{3}{4}$ S., distant two-thirds of a mile from the entrance of the rivulet, or E. by N. rather more than a mile from the North point of Moturiki.

Moturiki Island, or *Matoriki*, lies 1 mile S.W. of Ovalau, and is 5 miles long N.W. and S.E. by one quarter to $1\frac{1}{4}$ mile wide. It is not so much broken as Ovalau, though it rises in the centre, forming a high ridge. There are many cocoa-nut groves on it, the property of a native chief. The reef extending from Ovalau surrounds Moturiki, and off its N.E. point are *Yanutha Islets*, on

the northern of which is the Quarantine Station. Boats can only pass between the northern islet and Ovalau.

There are two small islands, named *Thangalai* and *Leleuvia* (*Lele-Oubia* of D'Urville), to the South of Moturiki, and between these is the entrance to the bay of Mbau, termed the Moturiki Passage. Leleuvia, on the South side, is covered with cocoa-nut trees.

Two sunken coral patches were distinctly seen from H.M.S. *Brisk*, 1867, lying from about N. by W. to N.N.W., distant half a mile from Leleuvia Island; caution is therefore necessary when passing through the Moturiki Channel. At 2¼ miles E. by S. ½ S. of Leleuvia is *Nanga Sautambu*, a small kay with a bush on it.

Moturiki Passage is of considerable importance, as it leads to the Bay of Mbau, which contains some of the most powerful of the native towns; it is clear from obstruction, and is 1½ mile in length by half a mile wide. Some remarks on its navigation are given on page 720, *ante*. A W. by N. course (by compass) leads through it, and when Na Komba-levu or Black Peak, on Viti Levu, can be seen, it is a good leading mark. The tide sets with some strength through the passage, the flood running to the westward, or in, and the ebb to the eastward, or out. There is safe anchorage either under Leleuvia or Moturiki on their West sides, in from 7 to 12 fathoms; but a good and safe harbour exists on the Moturiki side by entering through a narrow channel before reaching Thangalai Island. This channel may be known by a large coral rock on the reef. After getting through the reef there is anchorage in from 7 to 10 fathoms, with sandy bottom.

YASAWA (or Asaua) GROUP.—The westernmost range of the Fiji group, called also the *Ba* or *Leeward Group*, are possibly the islands discovered by Capt. Maitland, of the American ship *Anna and Hope*, and named by him the *Land of Liberty*, and also the six islands seen by the *Arthur*, Capt. Barber, in 1794. D'Urville passed along the outside of the South portion of them, but meeting with a coral bank (perhaps that to the N.W. of Malolo), he bore away to the westward, thus concluding his examination of the Fijis.

This volcanic group extends about 50 miles N.N.E. and S.S.W., the islands, sixteen in number, being fringed with coral reef, and the space between them and the coast of Viti Levu is said to be full of coral patches. The reef extends 6 miles N.N.E. of the northernmost island, and between this and Awakalou Island, about 10 miles to the eastward, is *Round Island Passage*, which has not been closely examined. In 1879 the group had a population of 2,950, with 5 Europeans.

Vomo is the south-easternmost of the Yasawa group, and is 12½ miles westward of Cilau Point; it is famous for its turtles, which are abundant here from December to March. The southern half of the island has a high, narrow, and almost perpendicular bluff; the northern half is sand, covered with bushes,

and resorted to by pigeons. It is 380 ft. high, and 2 miles in circumference, surrounded by reef; off its N.W. end is a detached rock, 200 ft. high, named from its appearance *Castle Rock*. There is anchorage, but not well protected, for a small vessel. At 7 miles N.N.W. of Vomo is *White Rock*, 40 ft. high. At 12 miles West of Vomo is the northern group of the Mamanutha Islands.

Waia.—At 9½ miles N.W. by W. of Vomo is *Kowata Island*, the southernmost of the Waia group. The island of Waia, 3½ miles in length, is the highest and most broken of the Yasawa group, its highest peak being 1,870 ft. above the level of the sea. Closely connected with it to the southward are *Waia-lailai*, 1,160 ft. high, and *Waia-lailai-thake* or *Kowata*, both very rugged and broken. One of the peaks on the latter, named *Observatory Peak* by Wilkes, is 570 ft. high. Waia is said to be fruitful, but appears little better than a craggy rock, covered with verdure; it contains about 500 inhabitants. It is surrounded by a few patches of coral reef, and 6 cables off the N.E. point is *Windy Rock*, a rocky islet 40 ft. high, with a few bushes on it. The western sides of the islands are very much worn by the sea, in consequence of there being no sea reef to protect them from the full swell of the ocean, which is very great here at times.

There are two anchorages at Waia Island, called Alacrity and Watering Bays. *Alacrity Bay*, on its South side, is fairly protected, but a considerable swell rolls into the bay at times from the South. In entering, keep the S.W. high peak of Waia bearing N. by W. ½ W. until the summit of Waia-lailai bears E. by S., when steer for the black rocks on the shore reef at the head of the bay, keep clear of a 2-fathoms patch on the port hand; and anchor in 14 fathoms, sand and mud, off the village of Yalombi, with the left extremity of Waia-lailai and the right extremity of Waia in line, and the two islands appearing as one. No water or supplies were to be obtained. Sailing vessels entering with N.E. winds should reduce their sail on rounding the South point of Kowata, as heavy squalls sweep down the gullies and between the islands.

Watering Bay, on the North side, is 2 miles long and 1 mile in depth. At high tide good water can be easily obtained from a stream at the head of the bay. In entering, run in until Windy Rock is lost sight of behind the N.E. cape, and the N.W. cape bears W.N.W., or the summit of Waia E.N.E., when anchor in 20 fathoms, mud. In this position a vessel would not feel the swell raised by N.E. winds, and be in a good position for weighing. Two coral heads with 12 and 15 ft. of water on them lie just outside the bay, and there are many unexamined shallow coral banks between Waia and Viwa.

Vaviti, or *Naviti*, 8 miles to the N.N.E. of Waia, is the largest of the group, and rises to the height of 740 ft.; no anchorage could be found around it. This and the islands to the northward have passages between them, and are little incommoded by coral reefs. They have all many small villages on them, which are generally built on a snug bay, and have near them a secure

place of retreat on the top of some inaccessible rock. To the S.S.W. of Naviti are some small islands, named by Wilkes *Eld*, *Foxe*, *Agate*, and *Sinclair Islands*.

Yasawa, or *Ya-asaua*, the northernmost of the Yasawa group, is very narrow, and about 10 miles in length, N.N.E. and S.S.W. Towards its southern end it rises to a peak, called Tau-tha-ke, 781 ft. in height. From the summit of this peak the beautiful little bay of *Ya-sua-y-lau*, on its eastern side, appears to lie at the feet, with the picturesque rock on its eastern side, having much resemblance to a ruined castle or impregnable fortress. This rock, which is entirely volcanic, with but little vegetation on it, is the object of some superstition among the islanders, who believed it to have been the residence of an immense bird. The southern bight is well protected, except from the N.W., by the small island of Ovawo, and two small islets. At the N.W. end of Yasawa is *Emmons Bay*, in which the U.S. Expedition anchored. Off its North point are several small islets, from which the reef extends 6 miles to N.N.E.

Between Yasawa and Naviti, 14 miles to S.S.W., are a number of smaller islands, having passages between them.

Viwa, or *Biva*, is the westernmost of the group, and lies 13½ miles W.N.W. from the N.W. point of Waia. It is about 2 miles long, and 100 ft. high, surrounded by a reef, which extends 3½ miles South of it. There are heavy breakers on the South point of this reef, about a mile northward of which is a rock, 10 ft. high, and close to the S.W. side of the island is an islet covered with cocoa-nut palms. Near its southern end is the opening, but it is not practicable, even for a small vessel, without danger, from the numerous coral lumps. The island, which affords no anchorage, is inhabited by about fifty people.

About 10 miles N.E. ½ N. of Viwa is a detached coral shoal, on which the *Porpoise* struck, and occasional soundings were met with between it and the Yasawa group. About 2 miles E.N.E. of Porpoise Shoal is the S.W. extremity of *Ethel Reefs*, two narrow barrier reefs, each about 9 miles in length, lying 5 to 9 miles westward of, and parallel with, the central part of the Yasawa group.

Awakalou, or *Round Island*, is of a crescent form, rising to the height of 500 ft., and dropping at each end. There is no coral attached to it, but an extensive patch, on which there is anchorage, lies to the eastward, apparently unsafe however. The shelf around the island is of a black conglomerate.

For 10 miles southward of Awakalou are numerous patches of reef, and then an unbroken barrier reef appears to trend away in an E.N.E. direction for 24 miles towards Yendua Island, which it approaches within 4 miles. At 8 miles N.W. of Awakalou, the barrier reef again commences, and trends in an irregular E.N.E. direction for about 90 miles, with numerous openings, till it joins the reefs off the North coast of Vanua Levu.

KANDAVU, the south-westernmost of the Fiji Islands, was most probably first discovered by D'Urville, June, 1827. He surveyed the southern shores.*

Kandavu, of irregular shape, is 32 miles long, E.N.E. and W.S.W., by half a mile to 8 miles in breadth, and throughout its whole length is high and mountainous, except a small part at the narrow isthmus near Malatta Bay. It has reefs around its shores, like the other islands, and N.E. of it are the extensive Astrolabe Reefs, enclosing a lagoon with several small islands and numerous rocks in it. The island is well covered with pine timber, resembling the New Zealand kauri pine; and most of the large canoes used in the Fiji Islands are built here. The people are industrious, and formerly had abundance of provisions. Many whale-ships used to stop here for supplies, but of late years there has been a scarcity of food. In 1880 Kandavu had a native population of about 6,650, living in 160 or 170 towns. The white population, 37 in number, consisting of a few planters, &c., live principally on the South side of the island.

On its West end is *Mbuke Levu* (*Great Yam Heap*), or *Mount Washington*, which is 2,750 ft. high, in the form of a conspicuous cone, very much truncated at the summit, and the sides descending with a direct and rapid inclination from the summit to the sea. It is visible 50 miles in clear weather.†

Thickombia, the S.W. point of Kandavu, is a dark headland, 420 ft. high, on the East side of which is *Ndavingeile Bay*, 2 miles wide, affording indifferent anchorage, with numerous coral heads in it. A 12-ft. patch, breaking heavily in strong winds, lies nearly in the middle of the entrance. From Thickombia to *Cape Washington*, 3 miles to N.W. by N. ½ N., the shore is fringed with reefs, and about halfway is *Denham Island*, low, with some palms on it, between which and the shore small vessels can anchor in a bight in the reef, in South and East winds. Between Denham Island and Cape Washington the coast is bold and rugged, cliffs rising in one part 300 ft. high Cape Washington is a rocky bluff, 100 ft. high, 1½ mile westward of the mountain.

In *Tulaulia Bay*, eastward of Cape Washington, there is anchorage in 10 fathoms, off Ndongai village. At 7 miles N.E. by E. of the cape is *Richmond Bay*, affording protection for small vessels in nearly all winds; on its West side the reef extends 1¼ mile from the coast. At Richmond village is a Wesleyan school for educating native teachers; the mission station is marked

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* D'Urville sought this island as being the Mywolla discovered by Bligh in his *second* voyage, in 1792. But it certainly would seem that Mywolla is the same as Moala, to the E.N.E., and that Bligh passed between Totoya and Matuku, because there are no islands to the S.W. of Kandavu, as marked on Bligh's track, in such a situation. The distance, bearings, and drawing, are so bad in Bligh's track, that the discrepancies are not too great for such an assumption.

† *Tui Lau Breaker*, reported by a small schooner of that name to have been seen 43¼ miles S. ¾ W. of Mount Washington (thus placing it in latitude 19° 46′ S., long. 177° 43′ 30″ E.), was searched for in vain by H.M. Ships *Nymphe* and *Alacrity* in 1876.

by a conspicuous house on a hill, 400 yards inland, and a large building below it.

Tavuki or Tabuca Bay.—At 2½ miles eastward of Richmond is Tavuki village, at the head of Tavuki Bay, a very picturesque spot. Capt. Hope, R.N., of H.M.S. *Brisk*, 1868, says that Tavuki is an anchorage not to be recommended; the bay is full of coral patches of various depths. The most dangerous of these, a detached rock, called the *John Wesley*, lies about a third of a mile off the eastern point of the bay, and on it the sea only breaks at low water, when there is a swell. About a mile farther to the westward, off the centre of the bay, is a detached reef, always showing, and the passage into the anchorage lies between the two, but a tolerably wide berth must be given to the reef, as there are other patches to the eastward of it which do not show distinctly; upon one of these, with 10 ft. water, the *Brisk* struck while steaming slowly in to the anchorage. The bottom is very rocky and uneven, and accidents to the ground tackle frequently occur, but a sandy spot is said to exist. The bay is also subject to sudden gusts of wind from the high land. On its North side are some red cliffs, 500 ft. high.

Malatta Bay, eastward of Tavuki Bay, is small, and offers safety to a few vessels for temporary anchorage, although it is difficult to choose a place for the purpose, on account of several reefs that lie across it. Kandavu is here nearly divided into two, and so low and narrow is the isthmus, that the natives frequently transport their canoes over it.

Northward of Tavuki Bay, a barrier reef stretches 2 miles off shore, the space enclosed having numerous coral heads in it. *Asses Ears Peak*, 1,600 ft. high, is here conspicuous, when bearing about N.E. Northward of this peak is Uthuna Moindule, from which the coast trends N.E. by E. ½ E. for 9 miles to *Yale Point*, and is fringed with reefs. Between lie two small bays named *Naseile* and *Ndaku*. *Mount Challenger*, a conspicuous wooded peak, 2,180 ft. high, lies southward of the bays. *Mount Yale*, 1,180 ft. high, is covered with grass. At 2 cables from the East edge of Yale Reef, there is anchorage in 12 fathoms, and water may be had at high tide from the stream at Yale village.

From Yale Point the coast trends easterly, 3 miles, to *Kaseleka Bay*, where there is anchorage for small vessels. At its head is the principal town of Kandavu, where fresh water can be obtained. On its West coast is a large white patch on the cliffs. At 2 miles farther westward is *Kaivala*, *Lawake*, or *Ninderi Bay*, an inlet about 1¼ mile long by half a mile wide, with safe anchorage in 12 to 16 fathoms, mud. There are some coral patches in the entrance, and four villages on its shores. From hence the coast trends 4 miles to the S.E. to Uthuna Naingoro. The channnel between Kandavu and Ono, 2 miles wide, is full of coral heads.

Great Astrolabe Reef.—From off Naingoro this barrier reef takes a northerly direction for 25 miles, without a break in it. It is named after the French vessel, *Astrolabe*, Capt. D'Urville, which narrowly escaped shipwreck

here on the night of June 5th, 1827. At 5 miles N.E. of the East end of Ono the reef forms an elbow, upon which the sea breaks heavily. To the northward of this, and on its West side, the sea only breaks lightly on it, and it is therefore very dangerous, especially at night. On its West side the reef is much broken, and terminates at *Alacrity Rocks*, about a mile N.W. of Ono. There are several passages through it. This reef is not only dangerous from its extent, but from the strong currents, generally to the eastward, which prevail here.

North Astrolabe Reef is separated from the North end of Great Astrolabe Reef by *D'Urville Channel*, a deep passage a mile broad. It encloses a lagoon, about 4 miles in diameter, in the centre of which is *Solo* or *North Rock*, 10 ft. high, on which it has been proposed to erect a *lighthouse*. There are two entrances into the lagoon, on the northern side, the western, named *Beagle*, being the best, but the tides are rapid. When inside there is anchorage in 12 fathoms, among the coral patches. The sea only breaks lightly on this reef, so that a wide berth must be given to it.

Ono Island, or *Oumbenga*, is about 4 miles in diameter, rising to a conspicuous peak, 1,160 ft. high. The reef on its East side is divided from Astrolabe Reef by a very narrow but deep channel. In 1880 the natives numbered 790, with one European. Water may be obtained from a stream on the North side of the island. It is high water, on full and change, in the sandy bay on its N.W. coast, at 6^h; springs rise 6 ft., neaps $2\frac{3}{4}$ feet.

Northward of Ono, and all included within Great Astrolabe Reef, are about a dozen small grassy islands, some having a few cocoa-nut palms, the principal of which are Mbulia, Dravuni, and Yankuve. Temporary anchorage may be obtained in most parts of the lagoon. *Mbulia* or *Blunt Island*, $2\frac{1}{4}$ miles N.N.E. of Ono, is 460 ft. high, and has a village on its South side. *Yankuve* or *May Island*, $1\frac{1}{2}$ mile N.N.W. of Mbulia, is 400 ft. high, and uninhabited. There is anchorage in 3 fathoms, sand, on its western side. *Dravuni* or *Colvocoressis Island*, $1\frac{1}{4}$ mile N.N.W. of Yankuve, is about $1\frac{1}{4}$ mile in length, and rises at its South end to about 350 ft. above the sea. There is a village on its eastern side. Off the N.W. part, there is anchorage in 4 fathoms, sand, protected from the prevailing S.E. wind. *Vanua Kula* or *Reynold Island*, $1\frac{1}{2}$ mile N.W. by W. of Dravuni, and $2\frac{1}{2}$ miles from the northern extremity of the reef, is 250 ft. high, and covered with vegetation. It is uninhabited.

The East Coast of Kandavu.—Between Uthuna Naingoro and *Koro Levu Bay*, about 4 miles to the S.W., the indented shore is fronted by a barrier reef, with two breaks in it, the northern one, named Naingoro, being 160 yards wide, only available in daylight and very fine weather. *Koro Levu Bay* is deep, affording anchorage at its head in 12 fathoms, mud, but the narrow entrance through the barrier reef makes it unsuitable for sailing vessels. On the reef on either side is a small islet.

At 6 miles westward of Koro Levu is Uthuna Ngara Levu, the shore being

fronted the whole way by the barrier reef. In an inlet close westward of Koro Levu Bay is the town of *Kandavu*, where many canoes are built. Southward of the town, the barrier reefs form a dangerous spur, 2 miles off shore, on which the sea breaks heavily. At 2⅓ miles East of Ngara Levu is a small islet, with a remarkable clump of palms on it.

Between Uthuna Ngara Levu and the entrance of N'galoa Harbour, the barrier reef makes a bight, similar to that in the coast; at the head of the bight is a passage, 1½ cable wide, 4½ miles N.E. by E. from the East point of N'galoa Island, and available for sailing vessels, leading to *Soso Bay*. At the head of this bay is *Ndaku Isthmus*, 1,300 yards wide, and 200 ft. high. There is a large village on the eastern shore, and a conspicuous clump of palms stands on the summit of the eastern point, 500 ft. high. Overlooking Soso Bay is *Na Korutu*, a black hill, 1,260 ft. high, cleared of trees by a party from H.M.S. *Alacrity*, in 1876, except one on the summit.

N'galoa or Galoa Bay, which lies in the centre of the eastern side of Kandavu, was first surveyed in 1866-7, by Lieuts. Creak and Jackson, R.N. In 1874, H.M.S. *Challenger* visited and surveyed the port. The following information is chiefly by Lieut. H. Hosken, H.M.S. *Pearl*, 1873.

The position of N'galoa Bay may be known by a dip in the land, just to the N.E. of a remarkable gap in Kandavu Hills, which appears almost to divide Kandavu Island. This will point out the position of the bay, if N'galoa Island, which divides the bay into two portions, cannot be made out; for as the latter appears under high land, it often cannot be seen till the vessel is within 6 or 8 miles of the entrance.

N'galoa Harbour is protected from seaward by the reefs fringing that part of the island. *N'galoa Island*, about 1¾ mile in extent, is situated in the N.W. part of the harbour, forming to the north-eastward, North Bay; to the westward, Inner Harbour; and on its S.W. side, Outer Anchorage. Small vessels can be safely hauled up for repairs on a steep sand beach at its N.W. point, and also on the N.E. shore of the island.

North Bay is about 2 miles long East and West, and 1 mile broad, with depths of 19 to 20 fathoms near the centre, bottom sand and coral. *Inner Harbour* is about half a mile in extent, with 4½ to 6 fathoms, muddy bottom; at its head is *Tavukie Isthmus*, 900 yards wide. The *Outer Anchorage* has depths of 16 to 20 fathoms, muddy bottom; on the West side of Outer Anchorage a mud flat, fringed by a coral reef, dries 2 cables from the Kandavu shore, having 6 fathoms close to the edge in some parts, with patches of 2 and 3 fathoms at three-quarters of a cable, and 6 to 9 fathoms nearly 3 cables from the reef. *Wood Shoal*, with rocks awash at low water, lies on the S.E. side of Outer Anchorage, bearing S.E. ¾ S., distant 4½ cables from the South point of N'galoa Island.

The *Main Channel* leading into N'galoa Harbour is formed by *Esk Reef* on the North, and *Pearl Reef* on the South side; the channel is about 3 cables

broad, with a depth of 40 fathoms near the centre. There is an iron beacon on Pearl Reef. At the inner entrance of Main Channel, and bearing N.W. ½ N., 2 cables distant from the N.W. end of Pearl Reef, lies *McGregor Patch*, which dries at low water, and is marked by a *white buoy* on its South side. Between McGregor Patch and the East extreme of N'galoa Island there are several spots of 2 and 3 fathoms, with 6 to 8 fathoms close-to. Ships making from seaward for Main Channel should steer for Korah-to-Sarra, a conspicuous peak 1,643 ft. high, of sharp conical shape, until the breakers on the sea reef are discerned.

Boat Channel, on the East side of Esk Reef, is about 300 yards long and 50 yards broad, with depths of 3¾ to 4¾ fathoms. *Schooner Channel* is an opening in the fringing reef one quarter of a mile to the eastward of Boat Channel, and is about 150 yards broad, with 10 to 12 fathoms near the centre; on the N.E. side of the inner entrance of Schooner Channel there is a patch of 1½ to 3 fathoms. The left extreme of Anda Tavie Island, bearing N.W. by N. ¼ N., leads to the westward of this patch. *Anda Tavie*, the northern limit of the harbour, is 165 ft. high, and surmounted by a banyan tree.

It is high water, on full and change, in N'galoa Harbour, at 6^{h} 38^{m}; springs rise 5¼ ft., neaps 4½ feet.

The buoys in N'galoa Harbour are indifferently moored, and are not to be depended on, and the beacons, which formerly led into the harbour, are now destroyed. Great care is necessary in entering.

The sea reef, which forms the chief protection to N'galoa Harbour, extends 4¾ miles E. by N. from the South point of the harbour. At 1½ mile southward of this point the coast trends round to the westward for 3 miles to Ya-uravu Bay, and has a fringing reef. *Ya-uravu Bay* is about 2 miles in length N.E. and S.W., by 1 mile wide, and affords anchorage for steam-vessels in 14 to 16 fathoms, mud, but the entrance is 4 cables long and only 1 cable wide. Several small islands, covered with bushes, lie on the reef on the West side of the bay, and on this reef also lies *Matanuti Island*, the southernmost of the Kandavu group. It is 570 ft. high, covered with grass, and has a village on its West side. The reef extends about a mile S.W. by S. from it.

The coast between Matanuti Island and Koro-e-Rangi, 4½ miles to W. by S., has two considerable bights blocked with coral reef, extending about a mile from the shore. *Koro-e-Rangi*, on the East side of Ndavingeile Bay (p. 743), is a peninsula, 520 ft. high, covered with grass; the reef extends about 2 miles W.S.W. from its South end, forming the South side of the bay, and on which the sea breaks violently.

This completes the description of the islands of the Fiji group.

CHAPTER XV.

NEW HEBRIDES, ETC.

Quiros was the first to discover any portion of this fine, but hitherto little-known archipelago. He saw the northern and largest island of the group, which he named *Australia del Espiritu Santo*. The extent of this land, and of the bay in which they anchored, that of San Felipe and San Jago, which is about 36 miles in circuit, led them to the most exalted notions of its importance and magnitude. They concluded that it must be a portion of the long-talked-of and sought-for southern continent, but they made no explorations to satisfy themselves that their conjectures were well founded. In the different narratives which have been brought to light on this important voyage, there is no mention made of other islands. Quiros speaks only of one land; and in the memoir to King Philip III., on the colonization of this new continent, it is described as abounding with gold, silver, and pearls.

These visions as to the character of the land were dispelled by Bougainville, who saw that the northern part was composed of several islands, to which he gave the name of *Cyclades*. Cook discovered the greater portion of the southern chain, to which he applied the name of *New Hebrides*, in 1773. Thus the group collectively possessed two appellations, and it was proposed to limit each to the North or South portions; but as there is no marked division in the chain, and as Cook discovered the greater number, his name of New Hebrides has superseded those previously applied to them.

They have been but little visited, and consequently our knowledge of much of their geography is vague and imperfect. They have been visited by members of the Melanesian Mission. Lieut. Thos. C. Tilley, R.N., commanding the mission schooner *Southern Cross*, in 1864-5, has furnished some particulars subsequently quoted. More recent information, however, is found in Commander Markham's work, "The Cruise of the *Rosario*." Between October, 1871, and February, 1872, this vessel had occasion to touch at nearly very one of the New Hebrides and Santa Cruz Islands, to enquire into the

evils connected with the "labour traffic."* We are also indebted to Mr. Robert Haddock, for information relating to several of the islands, as hereafter noticed.

Winds, Weather, &c.—The fine weather or dry season among the New Hebrides and Solomon Islands may be said to extend from May to October, both months inclusive, and the wet season from November to April; occasionally much rain falls in the so-called dry season, and is generally accompanied by a change of wind from the eastward. The normal direction of the trade wind is from E.S.E., but the stronger winds, which usually succeed calms, are from S.E., and, as a rule, such may be expected when the wind veers round to East or N.E.

When in the vicinity of the islands, the prevailing trades are frequently interrupted, and calms occur, followed by easterly and north-easterly breezes, accompanied with rain; occasionally the wind backs round, by way of North to West, and the trade direction is resumed with what is known among the Banks Islands as the "Lan San," or strong S.E. wind.

Hurricanes prevail during the whole of the wet season, and blow with greatest violence during the months of January and February. It does not appear that they are of frequent occurrence, but the information on the subject, derived from the natives, is very vague.

The climate, from the luxuriance of the vegetation and the dampness of the soil, seems much less adapted to European constitutions than the Polynesian Islands, whose natives, also, suffer here from dysentery, fever, and ague.

The *Current* in this vicinity generally runs to the North and N.N.W., its velocity depending on the force of the wind.

The *natives* are of the black Papuan or Melanesian race, so frequently named, and who have always shown such hostility and treachery in their intercourse with the whites, who in their turn have treated them with much cruelty and injustice, especially in the carrying on of the labour traffic between these islands and the plantations of Fiji and Queensland. Their character, in those parts where the zealous missionary influence has been exerted, has become much less hostile, and more confiding; in 1879 it was stated that about 8,000 of the natives had been converted to Christianity. A peculiarity noticed by many navigators is their fondness for dancing. The Polynesian race is found to exist in some of the islands, as stated hereafter, in Cherry Island, Tecopia, and the Duff Islands. There are about twenty different languages spoken in the group.

The productions of the islands composing the New Hebrides, including

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* Interesting accounts of other visits to the New Hebrides, Santa Cruz Islands, &c., will be found in "Jottings during the Cruise of H.M.S. *Curacoa*, among the South Sea Islands in 1865," by J. L. Brenchley, M.A., 1873; "A Year in the New Hebrides, &c.," by F. A. Campbell, 1873; and "Wanderings, South and East," by Walter Coote, 1882.

Banks Islands, consist of bread-fruit, cocoa-nuts, sago, bananas, nutmegs, sugar-cane, taro, arrow-root, sweet potatoes, and yams. Pigs are also occasionally procurable at Banks Islands, but principally at Mai Island. Fish is abundant, but some poisonous sorts exist. The best articles for barter consist of beads, fish-hooks, calico, axes, bottles, and, in some of the less frequented islands, iron hoops and timber cut into short lengths.

ANEITEUM, or Annatom, is the southernmost of the New Hebrides, D'Urville, who sailed around its southern side in June, 1827, says it is surrounded by high mountains, which leave only a very narrow belt of low land on the shore; on this belt some clumps of cocoa-nut trees are seen scattered here and there, and more particularly a great number of trees with scanty foliage and bare trunks, which at a distance look very much like whitened skeletons standing up. The mountains have but few large trees, although generally covered with verdure. In many parts are large reddish patches. The highest peak, according to Captain Denham, is 2,788 ft. in height. The coast is usually fringed by a coral reef; on the S.W. side it extends off nearly 2 miles, sheltering the harbour. On the North shore it extends from half a mile to a mile off. The island appears to be moderately free from outlying reefs, but there is one about a mile off the West coast. Aneiteum is about 10 miles long, East and West, and 6 miles broad, North and South. Some plantations are established on it, belonging to Europeans. Severe shocks of earthquake are sometimes felt; on March 28th, 1875, a severe earthquake shock was felt, accompanied by a tidal wave, which washed away the two sand islets, 14 ft. high, inside the outer reef; when the water receded, the foreshore and fringing reef were left uncovered. The sand islets have again formed.

On its S.W. side is *Inyang* or *Anelcauhat Harbour*, which is easy of access, entered through a break in the surrounding reef, and formed by a sand islet and reefs, but it is open to westerly winds. It is, however, safe from April to October (the S.E. trade blowing steady during these months), and used to be resorted to by sandal-wood vessels occasionally. During the summer months westerly gales are frequently experienced, and several vessels have been wrecked here in those months. It is entered by bringing a clump of cocoa-nut trees to bear E. by N., till 5 or 6 cables from shore; anchor in about 14 fathoms, sand. At the head of the bay is a Mission station, the white church being conspicuous.

Excellent fresh water can be obtained within a short distance of the anchorage, and firewood can be procured in abundance. The natives, about 1,500 in number, are similar in appearance to those of Tanna, and their manners and customs much the same. The immolation of widows was practised here. It was the first island of the group visited by the missionaries, and its inhabitants are now much more civilized than those of the other islands.

Mr. James Paddon formed an establishment at this island in 1843. He

built several houses on the sand islet where he resided, and had three or four small vessels engaged collecting sandal-wood from the other islands. These buildings are now used as a whaling station.

Capt. Denham makes the Observatory Islet in Inyang Harbour in lat. 20° 15′ 17″ S., long. 169° 44′ 44″ E. High water, on full and change, at $6^h\ 35^m$; rise 4 feet.

On the opposite side of the island is *Anamé*, another Mission station, off which there is anchorage. The North coast has several small bays, but they afford no good anchorage in the S.E. winds. *Port Patrick*, near the middle of the North coast, is the principal, but is only fit for small vessels.

Erronan, or Fotuna, is an isolated cone, considerably truncated, with steep sides, its summit lying N. by E. ½ E., 42 miles distant from the N.E. end of Annatom. It is an enormous mass, about 10 miles in circumference, elevated 1,931 ft., and is sufficiently high to be seen 45 miles off. Its summit, according to D'Urville, is in lat. 19° 31′ 20″ S., long. 170° 4′ 15″ E., but later observations place it in long. 170° 11′ 15″. It is inhabited by a wild race, about 900 in number, similar to those on Tanna. There is, however, an English missionary on the island. Small vessels can anchor southward of the N.W. point, during the S.E. trades, but the water is deep, about 30 fathoms at 1½ cable off shore. The climate is said to be free from fever.

An anchorage can be found round the N.E. point for small vessels, well sheltered during strong S.E. trades. Provisions, such as pigs, fowls, yams, taro, and fruit, can be obtained all round the North and West coasts.—*Mr. George Haddock*, 1879.

TANNA, Tana, or Asore, was discovered by Capt. Cook in August, 1774. "At daybreak, August 4, we saw a low island (*Immer*) to the north-westward of us, having passed close to it during the night, and a high one nearly East of us (*Erronan*), at the distance of 8 or 9 leagues. The large island (*Tanna*), towards which we still directed our course, extended from N.W. to S.E., and consisted of a high range of mountains. Towards the south-eastern extremity, at the end of a secondary range of hills, we discovered a volcano, of which we had really seen the fire at night. It was a low hill, much lower than any in the same range, and of a conical shape, with a crater in the middle. Its colour was reddish brown, consisting of a heap of burnt stones, perfectly barren, but it afforded a very striking sight to our eyes. A column of heavy smoke rose up from time to time, like a great tree, whose crown gradually spread as it ascended. It is the most powerful volcano in the group. The whole island except the volcano, is well wooded, and contains abundance of fine cocoa-palms; its verdure, even at this season, which is the winter of these regions, was very rich and beautiful."—(Foster, vol. ii , page 261.)

The volcano was still active when Commander Markham landed here in 1872, and visited the crater, which was found to be about 600 ft. in diameter. The officers of H.M S. *Pearl*, 1875, found its height to be 980 ft. Mr. F. A.

Campbell says:—"This volcano is a splendid lighthouse; there is no mistaking it; the noise of its eruptions is heard distinctly upon Aneityum, fully 40 miles away."

The Island of Tanna is about 30 miles long and 10 miles broad, the mountains on its southern side rising in lofty wood-covered peaks to a height of about 3,500 ft. The northern hills are not so high, are rounded, and comparatively bare of vegetation. The island is very fertile, and well inhabited by a stout race of men, about 8,000 in number, similar in complexion to those of the Loyalty Islands. Tanna at times produces an abundance of excellent yams, and ships might obtain a large supply at moderate prices in the season, June, July, and August; but in 1875 food was scarce and the natives were averse to parting with their vegetable produce. There is no good fresh water on the island. Mr. Haddock states that provisions can be had on the North and N.E. coasts, but rather dear, in exchange for tobacco, pipes, gunpowder, or percussion caps. The island is highly cultivated, and some plantations have been established by white men. Two missionaries lived on the island at the time of Commander Markham's visit in 1872, one at Port Resolution and the other at Kwamere, at the South end of the island. The natives behaved well, although formerly they were cannibals; they are, however, constantly at war with one another.

The East side of Tanna is covered with thick forest, clothing the hills from base to summit, which rises to an estimated height of 3,000 ft., having been sighted from the deck of the *Pearl* at a distance of 66 miles. On the West side, the land runs down in a continuous slope from a cone-shaped mountain in the interior to the West point, which is low, a rocky spit projecting westward from it, with breakers to seaward, probably a quarter of a mile from the shore. Large tracts of nearly level country are to be seen on the West coast, covered with thick coarse grass. To the southward of the West point, the coast line is low, with several sandy beaches. The hills of the North coast are about 1,200 ft. high, and destitute of trees, the low land at their foot, is, however, thickly wooded. The West coast appeared to extend 3 miles westward of the position assigned to it on the chart.—*Lieut. H. Hosken*, H.M.S. *Pearl*.

Port Resolution, 8 miles to the eastward of the volcano, *Mount Yasowa*, was named by Cook after his vessel. The British Consul at Nouméa states that in August, 1878, about a fortnight after H.M.S. *Renard* had completed a re-survey, rendered necessary by the volcanic upheaval in January and February, 1878, another earthquake and extensive upheaval took place, and Port Resolution as a harbour is reported to be almost entirely destroyed.

Sir Edward Belcher says:—"Port Resolution may readily be found by a very remarkable yellow sandstone bluff at its N.W. angle, and which is situated to the northward of the entrance; also by the smoke of the volcano which bears West from it. Approaching from the southward the entrance of the port might be overshot, by reason of the overlapping breakers; but by

bearing in mind that it is formed by the *low peninsular* S.E. angle, and that the entrance is situated about 1 mile southerly of the yellow bluff, it will easily be found." When Sir Edward Belcher approached it the wind was dead out; but by edging close to the breakers on the left, and then hauling sharp up, the entrance was made, and in four boards a berth was reached inside in 6 fathoms. It is too narrow for a long vessel to work in, and it is preferable to shoot into 14 fathoms, and be prepared to warp. All the rocks lying off the N.W. side of the entrance are awash. A small pyramidal rock off the bluff, bearing W.S.W., leads up to the port.

Point Resolution, within the bay on the East side, is in lat. 19° 31′ 17″ S., long. 169° 29′ 0″ E. The mission-house is situated on it.

The above directions are now probably useless, as great alterations have taken place from the volcanic disturbances. No examination has yet been made since the last upheaval, so that vessels in this neighbourhood must use great caution, as there may be shoal ground off the port, a patch of discoloured water having been seen about 2 miles North of it.

About 5 miles to the N.W. of Port Resolution is *Wysissey Bay*, which is sheltered, and, although small, a vessel of moderate tonnage can anchor in moderate trade winds. Boats can generally land. At 12 miles northward of this bay is a small boat harbour called *Onebuckle*, where a boat can always put in for water except during strong E.N.E. to N.N.E. winds.—*Mr. George Haddock.*

About 15 miles to the N.W. of Port Resolution is an open bay called *Black Beach*, the native name of which is Waakus, or Lawaakus. Admiral Erskine anchored in it in the *Havannah*, in 15 fathoms, a mile off shore, and procured excellent water from a stream which runs into it.

There is good anchorage at Black Beach in 19 fathoms, with the bluff on the West side bearing S.W., distant half a mile. Should a swell set in from the North or N.W., a vessel should immediately put to sea, as it is a forerunner of the wind setting in strongly from that quarter. A dangerous 4-fathoms shoal lies about 5 miles N.E. from Black Beach, and 2 miles off the land; in heavy weather it has been seen to break.—*Mr. George Haddock.*

Sangalie Anchorage, on the S.W. side of the island, may be made by steering for a large house belonging to the plantation E. by N. Anchor in not less than 14 fathoms with the house on this bearing and the extremes of the land S.E. ¼ S. and N.W. ¼ N. From this position the boat cove bears N.E. by E.

Immer, Aniwa, or Niua, is a small, low, coral island, not more than 100 feet high, off the N.E. end of Tanna, and is covered with cocoa-nut trees; it is about 6 miles long, and 2 or 3 miles in breadth. It has about 240 inhabitants, and a missionary resides here. Immer is well supplied with all kinds of stock, but there are no springs of fresh water. It bears N. by E. ½ E.

15 miles from Port Resolution, and is said to have no good anchorage, but Mr. Haddock states there is an anchorage at the N.W. end.

ERROMANGO, or Eromango, is high and rocky, and presents an iron-bound shore nearly all round, with deep water close to the breakers, and no hidden dangers. It has no harbour, but anchorage may be found in *Cook Bay* on the East side, and *Dillon Bay* on the West. In Dillon Bay the bank is steep-to; the soundings extend a very short distance from the shore, and the best anchorage is in 12 fathoms off the mouth of the river. No stranger should anchor here unless in a case of necessity, as the natives are hostile and treacherous; and should the wind set in from the westward, a large vessel would have little chance of getting under weigh or beating out. The sandal-wood vessels are always ready for slipping in case of a westerly wind setting in. The anchorage in Elizabeth Bay (4 or 5 miles) to the northward cannot be recommended. This island produces nothing beyond the immediate wants of the inhabitants, and consequently holds out no inducement to visit it, except for sandal-wood. Its natives are cannibals, and are darker in complexion than those of Tanna, with woolly hair like negroes.—*Capt. Cheyne.*

The South side of the island is densely wooded, but on the West side a narrow belt of low land, with groves of cocoa-nut trees, borders the cliffs, and the tops of the hills near the coast have very few trees, but the distant mountains are clothed with forest.

Dillon Bay.—This bay is reported to have shoaled since 1861, and in 1882 there was about 4 ft. over the river bar at low spring tides. The mission station is upon the North point of the river entrance, the houses showing to seaward. The Sandalwood station and wharves have been demolished. When upon the anchoring ground the white sand beaches both North and South of the bay are shut in by the land.—*Lieut. Ommaney*, H.M.S. *Espiégle.*

At the time of the visit of H.M.S. *Rosario*, there was a whaling establishment here, conducted by two Europeans. *Elizabeth Bay* may be recognised by a large plantation, with a white house on it.

On the N.E. and eastern side of this island there are two bays, named *Polenia*, or *Walter*, and *Cook*, in the northernmost of which, Polenia, the *Resolution* anchored in 1774. In the latter Capt. Cook had a skirmish with the natives, who attempted to draw his boat on shore, and discharged some stones and arrows at him and his crew—a circumstance which prevented a particular examination of the island. There is a good boat harbour at the bottom of Cook Bay. The western coast of the northern bay was covered with thousands of palms, which had a beautiful effect; the second bay extended very far inland, and seemed to contain several snug creeks or harbours. The lands on both sides were covered with the thickest woods, which had a most fertile and enchanting appearance. To the South the land sloped very gently, offering a fine exposure of vast extent, almost wholly cultivated, and in all likelihood rich in vegetable productions. A saddle-peak, dividing the

two bays, was named *Traitor's Head*, about 4 miles to the N.E. of which is *High Rocky Island*, well wooded, and inhabited.

In the S.W. corner of *Polenia Bay* H.M.S. *Basilisk* found good anchorage in 5 fathoms, black sand, 1 mile from the shore. A landing-place for boats exists under the protection of a coral reef at the head of the bay. In 1879, the French cruiser *Ségond* anchored in Cook Bay in about 8 fathoms, black sand, the N.E. point of the bay bearing N.E. ¾ N., and the S.E. point S.E. by E. ½ E.

There is a good boat harbour on the S.E. extreme of Erromango, where cocoa-nuts, sugar-cane, bread-fruit, &c., can be obtained.—*Mr. G. Haddock.*

It was on Erromango that Mr. Williams, the author of "Missionary Enterprise," was murdered. Since then four other missionaries have shared the same fate, the last one Mr. Gordon, in 1872, the islanders being singularly dark-hearted and superstitious.

VATE, or SANDWICH ISLAND, is about 15 miles in length, N.W. by W. and S.E. by E. Capt. Cook only saw its N.W. part at a distance. Its East coast was found by H.M.S. *Nymphe*, 1877, to extend 10 miles further eastward than was marked upon the chart, and it is generally considered that the island is about 40 miles in length.

Sandwich Island is moderately elevated, and presents a beautiful appearance. It is the finest island of the New Hebrides, and would be the best adapted for colonization, but its climate is unhealthy. Some plantations have been established, but do not seem to prosper. It produces many varieties of fine timber; the soil is good, and the vegetation luxuriant; yams and sweet potatoes of a superior quality are extensively cultivated by the natives. It also produces bread-fruit, cocoa-nuts, bananas, and sugar-cane in abundance. The sandal-wood tree grows on this island. Its western side seemed to be clothed with rich and extensive forests.

The natives are of the black race, but appear to have a greater mixture of Polynesian blood than their neighbours, which may have arisen from the immigration of a body of Samoans some years ago, as their language contains many pure Samoan words. The population appears to be considerable, but divided into tribes of 300 or 400 persons, which are frequently as a matter of course at war with each other. They are (or were) cannibals, and there are several testimonies to their atrocious practices. Notwithstanding the favourable opinion their more refined manners might induce, and the opinions expressed by some missionaries, which are not held by others, they should never be trusted. An English missionary and some native teachers reside at Havannah Harbour.

Vate is possessed of several good harbours; the one on the West side, Havannah, is spacious, easy of ingress, and sheltered from all winds. It is formed by two large islands, with a narrow passage between them having 5 fathoms water in mid-channel. The southern entrance to this harbour is a mile

wide, clear of hidden dangers, and may easily be known by a remarkable island which lies off the entrance to the S.W. This island has the appearance of a broad-brimmed hat, and may be passed on either side. The anchorage is at the N.E. part of the harbour, where soundings will be found; and a ship of any size may anchor in 15 fathoms, one quarter of a mile from the shore, perfectly land-locked, and secure from all winds. Excellent fresh water, and abundance of fire-wood, can be easily obtained near the anchorage.—*Captain Cheyne.*

Havannah Harbour.—Admiral Erskine came here in H.M.S. *Havannah*, in September, 1849, and making the low S.E. end, steered to the N.W., passing a large opening which was understood to be the S.W. bay, called by the natives *Pango*, and when within a few miles of the S.W. point of Vate, made a small island of a very remarkable shape, resembling a low-crowned hat, with a broad brim, indicating the entrance to a capacious harbour. They hauled in, leaving the island on the port hand, working up a channel in which no bottom was found with 25 fathoms. Entered a large land-locked harbour, and anchored in 21 fathoms, at 5 or 6 miles from the entrance. Reefs were seen extending some distance from the N.W. and S.E. points of Hat Island.

On *White Sand Point*, within Havannah Harbour, is situated the mission station, and to the southward of the point are some rocky patches extending 2 cables from the shore. To clear these, keep Bluff Point open northward of Missionary or White Sand Point, N.E. ½ N., which will lead northward of them. A small reef, dry at low tides, extends 1 cable from Reef Point.

The usual anchorage is in Matapou Bay in 18 fathoms, and 12 fathoms will be found within 50 yards of the beach. Sheep, poultry, vegetables, and bread can be obtained. Water can be got from a stream near the flag-staff. It is high water, on full and change, at $6^h\ 40^m$; springs rise 3 ft. 10 in.—*Lieut. G. E. Richards*, H.M.S. *Renard*, 1879.

A large plantation, with substantial buildings, lies westward of the watering place, the flag-staff of which bears S. by W. ¾ W. from the anchorage.

This harbour was named from the first ship of war that had entered it, Havannah Harbour. It is formed by the main land of Vate on the South and East sides, and on the West and North by two islands, Leausau, or Protection Island, and Moso, or Deception Island. Between these two islands there is a safe passage, about 2 cables wide, said to have not less than 6 fathoms in the centre, which would greatly shorten the distance on leaving the port, and spare the ship the heavy squalls she is likely to encounter in running down the channel to Hat Island. Care must be used in taking this channel, as a sandbank runs off some distance from the S.W. point of Deception Island. It is also said that there is a good boat passage between Moso and the main, at half tide, opening into a large sound on the North side of Vate, bounded by Cook, Montague, and Hinchinbroke Islands. A reef extends a quarter of a mile northward of Deception Island, awash, and partly dry at low water.

A low, green point bears N. 33° E. from Missionary Point, and a remarkable distinct peak, S. 33° W., was made by Mr. Hilliard in lat. 17° 31′ 35″ S., long. 168° 26′ E. It is high water, on full and change, at $8\frac{1}{4}^{h}$; rise 3 to 4 ft.

Pano Bay, in the S.W. part of the island, is about 5 miles across. A reef extends from the northern point, which should not be rounded closer than half a mile.

There is a good anchorage in *S.W.* or *Vele Harbour*, under an island, passing it on the starboard hand; round the island and anchor 2 or 3 cables off the village on the island in 9 to 10 fathoms. I piloted H.M.S. *Basilisk*, in 1872. There is a Missionary on Pango Point, the South side of entrance into the bay. The bay is clear of any danger, and a vessel of any tonnage can work in it. —*Mr. George Haddock.*

Near the N.E. point of Vate are the small islands *Montague*, 1,500 ft. high, and *Hinchinbroke*, or *Vele*, 800 ft. high, with two or three islets. Between the two westernmost points of *Muna* or Montague Island is *Na-ora-matua Harbour*, affording fair temporary anchorage with S.E. winds, but exposed to the westward. The S.E. corner of the bay is dangerous, as the water shoals suddenly. To enter, keep Tavanakie, the highest peak of the island, bearing S.E. by E. $\frac{1}{2}$ E., and anchor with the peak on that bearing, and the North point of the bay N. by E. $\frac{3}{4}$ E., in about 13 fathoms, coral bottom. Boat landing is possible from 2 hours before till 2 hours after high water. The natives are said to be treacherous cannibals.

Short reefs stretch off the western points of Montague Island; its South coast appears safe to approach, for a distance of 3 miles, eastward of the western point, and should probably extend $1\frac{1}{4}$ mile further to the westward than the chart shows. Mr. Haddock states there is an anchorage to the North of Montague Island, off a black shingle beach.

Pele Island is separated from Montague Island by a narrow channel, with a passage for small craft, with fair winds. The island is hilly, about 2 miles in length, and 300 ft. high. A reef was seen to extend from its southern side, upon which the sea was breaking. *Fly Island* is low and covered with trees. Its position has not been accurately ascertained, but was considered by Lieut. Hosken, H.M.S. *Pearl*, to be shown about 4 miles too far East upon the chart. Caution is necessary in navigating the channels between Sandwich Island and the off-lying islands, as no correct survey has yet been made.

Shepherd Islands.—Between Sandwich Island and Api Island, the next larger one to the northward, are several small islands. The range which extends for 15 miles to the S.E. of Api, Cook named *Shepherd Isles*, after his friend the astronomer. There is some doubt as to the correct position of these islands; it is considered that they ought to be placed farther to the N.E.; vessels, therefore, passing from the southward should give them a berth of 30 miles, as there also appears to be a strong indraught. There are three large and three small islands in the group, ranging from 1,800 to 600 ft. above the

sea. It is reported that temporary anchorage may be obtained on the West side of *Tongoa Island*, near the S.W. extremity, in about lat. 16° 55′ S The passage between Tongoa, the northern and largest of the Shepherd Islands, and Api or Tasico, should not be used by strangers, as there are strong tide rips. Numerous reefs and shoals were seen in it from H.M.S. *Dido*.

Tongoa is well inhabited, but has no good anchorage. Provisions are procurable. A Mission Teacher lives on the small islet to the S.E.—*Mr. George Haddock*.

Mai or Three Hills Island lies about 12 miles to the South of Api, and is remarkable for the three mountains from which Cook applied the name. *Cook Reef*, a dangerous reef, lies W. by N. from its West point, 5 miles distant; the sea breaks heavily on it. A reef also extends 2 miles off the N.E. end of the island in an easterly direction. Mr. Haddock states that on rounding the reef on the N.E. extreme is a good boat harbour. Provisions in plenty, according to the season. There is a coral reef about 2½ miles N.W. of Mai; a rock is always awash on it.

Lieut. Tilley, R.N., 1865, says:—Mai, or Three Hills Island, may easily be known by its three elevations, which are respectively 1,850, 1,450, and 1,400 feet high. The eastern and highest hill, Rave-ná, is the most regular in outline, with a gentle slope from its summit, whilst its sides are thickly cultivated. The island lies about N.E. and S.W. for a distance of 6 miles, the average breadth being about 2½ miles.

A supply of pigs and yams, the latter very good, may be procured, the barter used by the *Southern Cross* being calico and tomahawks. No fresh water is obtainable, and but little firewood. The population has been estimated to be about 800 or 1,200, and in this small island no less than three dialects are spoken. The character of the natives is noisy and quarrelsome, and during communication strangers should be on their guard against surprise.

Anchorage may be found in from 8 to 6 fathoms, white sand, within a mile of the shore, on the north-western or lee side of the island, off a bight in the fringe reef which surrounds the island, with the summit of Rave-ná E. ¾ N. The landing place on the beach opposite the anchorage was found to be in lat. 17° 3′ 33″ S., long. 168° 20′ E.

It is high water, on full and change, at Mai Island, about $6^h\ 30^m$, with a spring rise of 5 ft. At the anchorage the tidal current runs at the rate of 1½ knot an hour; the flood setting to the eastward, and the ebb in a contrary direction. A strong current has been found at times between Mai and Shepherd Islands.

Makura, a small island 600 ft. high, lies 4 miles S.E. of Mai, or Three Hills, and is of the shape of a quoin. A sand spit runs off the N.W. extreme, where a small vessel can anchor; provisions can be procured here.—*Mr. G. Haddock*.

Two Hills Island lies 11 miles southward of Mai Island, and is 1,650 ft. high. A rock, 430 ft. high, called the *Monument*, lies about 1½ or 2 miles to

the East of it. Landing was found difficult by the boats of H.M.S. *Basilisk*. The natives, about 90 in number, were friendly; and a native teacher was settled among them in 1872. From a distance of more than 5 miles, the eastern of its two hills appears separated from the island, the land between being low. Discoloured water extended about half a mile northward of the island.

Api, or Tasiko Island, was not closely examined by Cook. It has three peaks, the centre one 2,800 ft., the north-western 2,500, and the eastern 1,800 ft. above the sea. Lieut. Tilley, R.N., thus describes it:—This island is about 25 miles in length in a N.W. and S.E. direction, and from 6 to 10 miles in breadth; it is of a very fertile character, well wooded, with a high range on its western part.

The island is apparently thickly inhabited, and the natives, in character and appearance, resemble the inhabitants of Mai Island. Three different languages are spoken. Fringe reefs run out at intervals to about a quarter of a mile from the shore; and in no case (excepting in the bay South of the Foreland, where there are several patches), were any observed to extend beyond half a mile. But about a mile South of Pane, which lies nearly midway between the Foreland and La Menu, and from a half to three quarters of a mile outside the fringe reef, is a coral knoll, about 100 yards in diameter, awash at low water.

At *Sakan*, or *Sukau*, on the South shore, yams may be procured, but great caution is necessary when landing, as on such occasions hostile tribes assemble to barter, and may at any time resort to violence.

The anchorage of Sukau is in 10 or 15 fathoms, about half a mile from the fringe reef (which extends a short quarter of a mile off shore), with Namuku Islet S.W., and the North end of Tongoa Island just shut in behind the S.E. point of Api Island.

"Found no natives in Kambioka Bay at the S.E. end of the island. Landing is difficult, and an extensive lagoon, with quantities of wild duck, lies near the beach."—H.M.S. *Basilisk*, 1872.

Anchorage was found by H.M.S. *Wolverene*, in 1880, in 20 fathoms, two-thirds of a mile off the coast, in a small bay South of the Foreland, formed by reefs extending westward from the land. From the anchorage the water shoaled gradually to the shore, one cable distant from which 5 fathoms was obtained. Good and safe anchorage was found close under the Foreland upon the North side, protected from the prevailing wind and swell, and having a good beach for landing. The natives were found to be friendly.—*Lieut. W. J. Symons.*

Inside *Menu Island*, which lies near the N.W. point of Api, is a bay, having a depth of 30 fathoms close to the beach; and about 3 miles to the westward of this island there is a small patch with 6 ft. water on it. A reef extends half a mile southward of Menu.

Anchorage may be obtained in the bight on the S.E. side of Api Island, in lat. 16° 39′ S. The channel between Api and Lopevi is clear of danger.

Namuku Islet, off the centre of the South side of Api Island, is conical, covered with trees, and stands out well from the mainland. It lies in lat. 16° 50′ S., long. 168° 20′ E., rising to an elevation of 500 ft., and has a fringe reef off its eastern side. Several tide rips were observed at the distance of a mile off the S.E. point of the islet.

" Anchorage can be had to the N.W. of the small island of Namaku on the S.E. extreme in moderate weather. Provisions in large quantities to be had here in the season. Good anchorage, sand and mud, can be had to the northward of the Foreland, in any of the bays, but a look-out should be kept, a there are a few dangers, which can easily be avoided. Provisions of all kinds are procurable in barter. A strong tide runs between Manu Islet and the main island of Api. The black rocks at the East extreme, between Api and Tongoa, are inhabited. There is a small bay on the West side of the largest, where a boat can communicate with the natives, who live on the top of an inaccessible precipice. They lower a bark rope with some bread-fruit in barter."—*Mr. George Haddock.*

Paama or Paum Island, a sharp cone, lies North and South, about 5 miles long by 1½ mile broad; its height ranges from 1,700 to 1,900 ft. The approximate position of the southern point is lat. 16° 30′ S., long. 168° 12′ E., and it lies 4 miles from the N.W. extreme of Api. The eastern side of Paama appears to be clear of dangers and steep-to.

Close off the South point lie a cluster of rocks, the largest of which is known as the *Ninepin;* the whole are encircled by a reef extending about a quarter of a mile from the shore. This reef shelters a small bight with a rough stony beach lying westward of South point. About three-quarters of a mile N.W. of the S.W. point, and half a mile from the shore, lies a patch about 200 yards in extent, on which there is only an occasional break; it is therefore dangerous. There is another shoal nearer to the shore, and about three-quarters of a mile to the northward of this patch. Near the N.W. extreme, a little to the southward of the point, and close to the shore, there is a small patch, and a short spit runs off the northern point. A village was observed about 1½ mile southward of the N.W. point, and the whole coast is evidently inhabited. The crater was very active.

Paama Island has an anchorage on the West side in 12 fathoms a little to the northward of the reef, in lat. about 16° 26′ S.

Dangerous Reef.—The brigantine *Mary Stewart*, in June, 1874, struck on a reef said to lie 1½ mile to the westward of Paama Island, in lat. 16° 28′ S. The weather at the time being dull and overcast, and the water discoloured by rain, no indication of the reef was seen until the vessel struck.

Lopevi Island lies 3 miles eastward of Paama, with a clear passage between. It is a perfect cone, rising to the height of about 5,000 ft., which at the time of Commander Markham's visit in 1871 had smoke issuing from its summit.

Landing is difficult from the surf. The best landing is on a small beach, bearing West from the peak. Natives friendly, but few in number.

AMBRYM ISLAND lies to the northward of Paama; its bluff S.E. point is stated to be in lat. 16° 17′ S., long. 168° 17′ E. *Dip Point*, 200 ft. high, the West extreme, is easily recognised by its name. A small fringing reef extends round the coast, which otherwise appears clear of danger. A good anchorage, with off-shore winds, exists in 8 fathoms, dark volcanic sand, about half a mile from shore, and a little northward from Dip Point. The water deepens gradually to seaward.

The height of Crater Mountain, which is generally an active volcano, is 3,500 ft., and of the peaked mountain on the northern end of the island 3,110 ft.; as seen from the N.W., the latter has a beautiful and imposing appearance from its symmetrical shape, and the luxuriant vegetation on its lower slopes. A fringe reef extends for half a mile off the North face abreast a village named Loliwar. H.M.S. *Rosario*, lying off this village in 1871, was covered by fine dust from the volcano, and the explosions were distinctly heard.

Rodds Anchorage.—Traders anchor close in off the white sandy beach in the bay just S.W. of Loliwar Point; this is known as Rodds Anchorage, and large quantities of yams have been obtained here. It is a secure anchorage for large vessels during the S.E. winds; the high peak at the North end of Ambrym bearing S.S.E., and the white sandy beach East, are good marks for the anchorage. In 1878 the natives appeared friendly but shy; no supplies could be obtained. H.M.S. *Basilisk* anchored here in 1872, and found it a good roadstead, with good holding ground and regular soundings, gradually decreasing from 20 fathoms, sandy bottom. About halfway along the S.W. side of the island is a bay, off the point of which discoloured water was observed extending for a short distance to the southward.

Temporary anchorage may be found off the S.E. end of the island a quarter to half a mile from the beach.

The passage between Ambrym and Whitsuntide Island is a good one, but occasionally there is a fiery breeze with a short sea. In standing towards Ambrym the reef off Loliwar should be looked out for; there is generally a wash on it; and in standing towards Whitsuntide Island, while westward of its South bluff, it should not be approached within three-quarters of a mile as a reef that breaks occasionally extends along shore at about half a mile off, between the South point and the next to the N.W. The reef does not, however, extend so far as the South point, which appears to be bold. No other dangers were seen.

In mid-channel and on the Ambrym side a lee or westerly set was observed, while over on the Whitsuntide coast there seemed to be a counter set to the eastward.

Calms and light airs prevail on the N.W. side of the island and on Dip Point, which should not therefore be approached too closely.

The channel between Ambrym and Mallicollo Islands should be used with caution during the night, for whilst the land about Dip Point (Ambrym Island) is steep and high, that on the Mallicollo shore is low at the coast line, with higher land as a background, and the tendency is to be drawn over towards Port Sandwich, whilst thinking the vessel is working down in mid-channel. Below Dip Point, the western shore of Ambrym Island is also low. —*Lieut. Tilley, R.N.*

Off the East coast of Ambrym there is a strong southerly set, directly on to the North coast of Paama Island, rendering this vicinity dangerous for a sailing vessel in light winds or calms.

MALLICOLLO ISLAND is about 54 miles in length in a N.W. and S.E. direction, varying from 7 to 20 miles in width. It was at Mallicollo that Dr. Selwyn nearly lost his life in 1851. The bishop and his boat's crew were attacked by the natives while watering, and but for the courage of the bishop, who bade all walk straight on through the crowd which had assembled on the beach to prevent their return to the boat, the whole party would have been massacred. The next day the natives were most friendly, stating, as an excuse, that they had been previously ill-treated by the crew of another vessel, and that they had determined to retaliate, not recognising the good bishop.

Port Sandwich is near the S.E. point of this island. Cook anchored here July 21, 1774, and found it very safe. It is 3 miles long in a S.W. by S. direction, and a mile broad. The entrance is between some rocks, which renders it narrow for ingress and egress; however, it gradually decreases to 4 fathoms. It was surveyed by the officers of H.M.S. *Havannah*, in 1850. It has good holding ground, sheltered from all winds; when the N.W. extreme of Ambrym Island bears N.N.E. the port will be open. Water of inferior quality may be procured at high water by sending boats 2 or 3 miles up the *River Erskine*, which enters the harbour on its West side, about 2 miles within the entrance. On the opposite side is Observation Point, which was made in about lat. 16° 25′ 50″ S., long. 167° 49′ E., nearly identical with Cook. It is high water, on full and change, at $5^h\ 30^m$; springs rise 4 feet.

The North head of the port is a prominent well-wooded bluff. The land westward of it trends into a deep bight, which might in thick weather be mistaken for the port. In entering, after passing the North head, steer to the south-westward until the bluff southward of the North head bears N.N.E.; then S.S.W. until the low sand point South of Observation Point, on the eastern side and at the head of the harbour, bears S.S.E.; then haul quickly up towards this point in order to clear the extension of the mud flats off the western shore. Care should be taken not to bring the low sand point just spoken of to bear eastward of S.E., until well over on the eastern shore.

H.M.S. *Pearl*, in 1875, touched on a spit to the northward of Erskine River,

and about 3 cables W. by S. from Observation Point, about an hour before low water, the least depth obtained at the time being 12 feet.

Sans Souci Anchorage, about 10 miles northward of Port Sandwich, affords excellent protection from the S.E. trade wind, but is open to winds from North and N.E.. In 1877 copra was being manufactured here. Good water may be had from a stream, close to the house of an American resident.

Near to the S.E. point of the island is a group of islands, to which Cook has given no name. They may be called *Maskelyne Islands*, as was proposed by Mr. Wales, the astronomer. A barrier reef extends about 2 miles S.E. from them.

Several islands lie off the South coast, which is indented by several deep bays, and at 5 miles S.W. from the S.W. end of the island there is said to be a small wooded island with a reef off it.

South-West Bay.—A reef, generally breaking, stretches from 6 to 7 cables northward of the island off the North point of the high western promontory which forms South-West Bay. The shores of the bay, except the S.E., are high and clothed with verdure; the land to the S.E., where there is a lagoon, is low and covered with trees. Reefs extend 2 to 3 cables from the coast. There is a considerable extent of anchoring ground, having a sandy bottom, well protected from all winds but those from West, through North, to N.E., in about 7 fathoms, with the island off the S.W. point bearing S. 75° W.; the North extreme of land N. 32° W.; and the entrance to the lagoon S. 30° E.

In approaching this bay from the southward, the island off the S.W. point, which is conical in shape and of moderate height, should be rounded at a distance of about three-quarters of a mile, and all dangers will be avoided. When the entrance to the lagoon bears S.E. by S. ¼ S., steer for it, and anchor in from 7 to 12 fathoms, at a distance of about half a mile from the beach. Supplies are scarce, only a small quantity of fruit and vegetables being procurable. Wood pigeon abound near the lagoon.

From South-West Bay the coast trends N.W. by N. to a point distant 4¼ miles, and then N.N.W. for about 5 miles. A small islet lies about 7 miles northward of South-West Bay, and between this island and the point just alluded to, a fringe reef skirts the shore, extending 1½ mile seaward; after this point is reached the land trends away for 7 or 8 miles into a deep bight.

Espiègle Bay, on the N.W. coast of Mallicollo, may be recognised by a remarkable white patch on the South side of a gully at the head of the bay, also by the large sandy beach, which is the first of any size when approaching the coast from the northward. From hence to the North extreme of the island the land is low, flat, and densely wooded. H.M.S. *Espiègle* anchored in 12 fathoms, with the South point bearing S. by E., and the white patch S.E. by E. ¼ E. Excellent fresh water can be obtained at all times of tide from a stream running into the bay at the southern end of the sand beach.—*Lieut. Ommaney*, 1882.

A shoal of $4\frac{3}{4}$ fathoms has been reported to lie about 52 miles W. by S. of the North point of Mallicollo Island.

The *North-East* coast of Mallicollo is bordered with a succession of islets and fringe reef, which at one place is reported to extend to the distance of 3 miles from the shore, with only 2 fathoms on its extremity. The islet of *Orumbau* has a white sandy beach along its N.E. face, and is somewhat bluff at its S.E. extreme; the reef projects about half a mile from its northern end. This islet, which lies in lat. 16° 4′ S., long. 167° 21′ E., is covered with cocoa-nut trees, and has a good landing-place on a steep beach at its inner or western side, with deep water close to the beach. The natives were friendly when the islet was visited by the *Southern Cross* in 1864; from 200 to 300 were assembled on the beach, and the islet may possibly contain about 500 inhabitants.

Mr. Haddock states that there is good anchorage in South-West Bay, and in almost all the bays to the northward, but a good look-out must be kept. Natives shy, but not hostile, and carrying poisoned arrows. Provisions may be obtained.

Pentecote or Whitsuntide Island was thus named by Bougainville; its native name is *Aragh*. It is about 35 miles in length in a N.N.W. and S.S.E. direction, its South point being in lat. 15° 59′ S., long. 168° 10′ E., or about 5 miles N. by E. of Ambrym Island. It rises to a height of about 2,000 ft. and is clothed with luxuriant vegetation. Lieut. T. C. Tilley, R.N., was here in 1866. He says it has moderately high ranges, and occasionally fringe reefs on its western or lee side, extending in some cases half a mile off shore. There are two good watering-places towards the S.W. end of the island, where boats may lie a few fathoms off running streams; but it should be borne in mind that the beds of the streams are liable to change after heavy rains. It is apparently more thickly populated and highly cultivated than Aurora.

There is anchorage about a mile north-westward of the South point of Pentecôte Island in 11 fathoms, protected from East and S.E. winds. The South coast of this island is very irregular in outline; the hills are covered with thick foliage, and broken up by many valleys. The West coast is indented by several bays, the intervening points of which have reefs extending to a distance of as much as 3 cables, but there is said to be no anchorage except that just described near the South point. The North point of the island should not be passed nearer than half a mile, for heavy breakers have been seen off it.—*Lieut. H. Hosken.*

Communication was established with the natives at *Vunmarama*, a village on the cliffs at the N.W. point of the island, where, in general, a good supply of yams, &c., may be obtained. At the southern portion of the island the canoes are large, and the people dark, tall, and muscular. H.M.S. *Basilisk*, in 1872, found the natives numerous, friendly, and ready to barter. Commander Markham, however, did not succeed in opening up intercourse with

them in 1871. His boat's crew was attacked at the S.W. end of the island. The friendly reception of H.M.S. *Basilisk* may have been the result of punishment inflicted by H.M.S. *Rosario*.

Aurora or Maiwo Island is separated from Pentecôte Island by a channel 4 miles broad, and is of similar dimensions and direction. Its North point is in lat. 14° 56′ (14° 51′ by the chart), long. 168° 6′ E., according to D'Urville. The North side of the island is 2 or 3 miles wide, with a bight in the middle. Off the N.E. point a flat rock lies one-third of a mile off. A sandy beach stretches out towards it, on which is landing, with smooth water near the village. It has two good watering places on its western or lee side; one at *Laka-rere*, close to the double waterfall about 8 miles from the North point of the island, with temporary anchorage in 14 to 7 fathoms, hard bottom, about half a mile off shore, with the stream on with the double waterfall N.E. by E., and extremes of land N.W. by N. and S. by E. From three-quarters flood to quarter ebb, fresh water may be baled into a boat from a rushing stream. Some patches extend to the distance of a cable off the stream.

Laka-rere may be known from the offing by the rising land after passing the second platform from the northward, as well as by the double waterfall. There are no villages or houses near the watering-place, the natives living in the centre of the island. An interesting account of a visit to one of the villages will be found in "Wanderings, South and East," by W. Coote, Esq., 1882, pp. 126—133.

H.M.S. *Basilisk*, in 1872, found good anchorage and shelter from a strong "Lan San," or S.E. gale, off Laka-rere. The natives are shy and distrustful, not inclined to barter, and must be approached with caution.

The other watering place is at *Narovo-rovo*, about 10 miles from the South point of the island, in lat. 15° 11′ S., long. 168° 4′ E. Off it a shoal lies a quarter of a mile from the land. The locality may be recognised by its being abreast of the low neck of land which nearly divides the island South of the northern range. Here a boat may get within two or three times of her own length of a fine running stream, but an engine and hose, or other suitable means, must be employed. The island does not appear to be very populous; only a few canoes were seen by Lieut. Tilley in 1866. It is high water, on full and change, at Narovo-rovo, at 6^h; springs rise 5 feet.

Lepers Island, or *Isle des Lépreux*, thus named by Bougainville, lies 7 miles to the West of the South end of Aurora, and is about 17 miles long N.E. by E. and S.W. by W. The magnificent mountain of this island, rising to the height of 3,000 or 4,000 ft., resembles a whale's back in outline, and from the sea assumes a most imposing appearance. Its native name is *Aoba* or *Opa*.

The *Southern Cross* coasted along the northern shore, which appears free from off-lying dangers, excepting off the N.E. point of the island, where there is a rock, awash at low spring tides, with the N.E. extreme bearing S.E. by S., and a wedge-shaped clay-coloured bluff S.W. Shoal water extends

half a mile from the East side of the island. Water is said to be obtainable from a bight immediately to the westward of the N.E. point, the only known place for the purpose being on the lee side of the island. H.M.S. *Basilisk*, in 1872, found the natives on the North shore numerous and friendly.* Very strong tide races are found on the western side of the island.

There is good anchorage on the N.W. side, at Walurigi, in from 9 to 13 fathoms, and off Boat Cove in 8½ to 12 fathoms, the bottom being black sand. Anchorage may also be found along the N.W. shore of this island generally, but no fresh water can be obtained. *Bice Road*, upon the North end, is stated to be the best anchorage. H.M.S. *Wolverene*, in 1879, anchored in four places upon the North coast, and found good landing places.

An abundance of yams and cocoa-nuts are grown on the island; but, in consequence of the swell on all the beaches, it is difficult to land a ship's boat; and the natives, though apparently energetic, have not yet accustomed themselves to bring off supplies in their canoes, which, though numerous, are small.—*Lieut. Tilley, R.N.*

The current sets strongly to the eastward on the North coast of Lepers Island, joining a strong stream which sets South along the West coast of Aurora Island, thus causing the strait dividing these islands to abound in tide rips and whirls.—*Lieut. Morgan*, H.M.S. *Alacrity*, 1875.

ESPIRITU SANTO ISLAND, or St. Esprit, the largest of the New Hebrides, is as stated previously, the only discovery of Quiros in 1606. Cook, having sailed nearly round it, has given a tolerably accurate notion of its figure and extent. It is 65 miles in length, N.N.W. and S.S.E., and about half that breadth in its southern part. Its N.W. extreme, *Cape Cumberland* of Cook, is in lat. 14° 36′ S., long. 166° 38′ E., and its S.W. point, *Cape Lisburne*, is in lat. 15° 40′ S., long. 166° 44′ E. It rather partakes of the character of an archipelago than a single island, from the numerous islands clustered around its shores.

The approach to Espiritu Santo from the eastward is not without its dangers; although the land is high, rising to nearly 5,000 ft., yet it is not always visible until within a proximity which claims a regard to caution; in the night the high land is generally closely garbed in mist. There are many good harbours to the southward of St. Philip Bay, situated inside the reefs and islets.

Espiritu Santo Islands appear to be thickly inhabited. The natives are deceitful and treacherous, maintaining the character of the Papuans by their

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* We must not omit again to caution our readers against being too free with the natives of these islands, as although they may appear friendly in sight of a powerful man-of-war, yet it would be unsafe for a small unarmed vessel to approach them without great caution. The northern islands of the group have not been so much visited as the southern, either by missionaries or traders.

double-facedness; they are strong and athletic, and well supplied with offensive weapons; we believe them the most powerful class of the inhabitants of the New Hebrides, and that the voice of their authority is heard by the natives of the other islands.

The productions of the island are nearly the same as those of the other islands. They appear to attach great value to turtle-shell, small quantities of which they sometimes possess. The pearl oyster, too, is very abundant here, and probably large collections of that article might be made by traders.

Not far from Cape Cumberland (at the northern part of the island) are to be seen appearances of several singular antiquities, in the shape of ruined edifices of great size; pillars of regular shape composed of large stones, detached portions of wall, and fragments of cemented masonry, are scattered over a plain of about 3 miles in extent; the mortar with which the stones appear to have been connected resembles chunam.

In a settlement about 5 miles distant from Cape Cumberland, are the remains of another edifice similar to the one above described; the natives appear profoundly ignorant of its design, and the mystical word *tabu* crowns the query of the stranger.

St. Philip Bay.—Capt. Cook gave this bay the name of *St. Philip* and *St. Iago;* but it is still somewhat doubtful whether it is the same which Quiros has distinguished by that name; at least the Port of *Vera Cruz*, which, according to that navigator, has room for a thousand ships, is not to be found in it. The eastern point of the entrance was named *Cape Quiros.* The western point extends much more to the northward, and was named *Cape Cumberland.* Quiros had great reason to extol the beauty and fertility of this country; it is, to appearance, one of the finest in the world.

The western shores of the bay consist of high ridges of mountains, increasing in altitude from 1,000 to 4,000 ft., as the centre of the island is approached. At the head of the bay, the hills form a plateau about 800 ft. in height, which decreases in successive steps towards Cape Quiros.

Lieut. Tilley, R.N., says the Bay of St. Philip is not so deep as it appears on the charts; the mouth of the River Jordan, which flows into the head of the bay, was found to be in lat. 15° 9′ 41″ S., long. 166° 53′ 15″ E.

The anchorage is off Jordan River, with the mouth of the river on with the right fall of the Table Hill, on the eastern part of the bay, S.E. by E. ¼ E. The bank on which anchorage can be obtained is of small dimensions, and care must be taken in picking it up. H.M.S. *Pearl* anchored upon it in 22 fathoms, with the mouth of Jordan River bearing S.E. by E., and Cape Quiros N. by E. She had 13 fathoms when swung in-shore, and 48 fathoms when swung to seaward.

Table Hill is hat-shaped, and has several white patches on its face. H.M.S. *Pearl* found depths of 20 to 30 fathoms at the head of the bay, at

about 2 cables from the beach. At 1 cable off Jordan River the depth on the spit is 5 fathoms, deepening to 17 fathoms at 1½ cable off.

This is a most convenient place for watering, as the boats pull into the river, where any quantity of good fresh water may be obtained. Sometimes, however, large boats cannot cross the bar, when a hose laid across the beach may be useful. Around the shores of the bay there are several patches, and from its S.W. angle they extend some distance off shore. Some little difficulty is experienced by sailing vessels making for the anchorage, on account of the prevalence of calms in the bay. The ordinary trade wind comes beautifully fresh and cool over the land, whilst the temperature is about 4° lower than in other parts of the group, and occasionally sea breezes from the northward contend with the trade winds when light.

The French cruiser *Ségond*, 1879, found an anchorage in the West angle of the bay, pointed out by a river and a salient point.

A few pigs and yams are to be procured here, and dry wood may generally be found on the beach.*

From off Cape Cumberland, which is a low tongue extending 2 miles from the high land, Capt. Cook proceeded to the southward along the western coast. The land was high, the mountains steep, and many fires were observed at night. A southerly breeze springing up, obliged the ship to stand off and on during two days, when she reached the S.W. point of the island, which was named *Cape Lisburne*.

To the southward of Espiritu Santo are several islands, the largest of which, quite 10 miles in length, was called *Bartholomew Island* by Cook. It is the N.E. point of the channel which Cook called *Bougainville Strait*, separating it from Mallicollo. The middle of this channel, which is 8 miles broad, is in lat. 15° 48′ S.

There is anchorage for small craft at the East end of St. Bartholomew Island, inside some small islets which are connected at low water with that island.

H.M.S. *Pearl* anchored in 10 fathoms, sand and broken coral, on the western side of St. Bartholomew Island, with the N.W. extreme of the island bearing N. 54° E.; the S.W. extreme S. 27° E.; and Hat Island S. 88° W. The tides were strong, flood setting to southward, and ebb to the northward, at a rate of from 2 to 3 knots an hour. It was high water, on full and change, at 6^{h} (approximate); rise and fall, 4 to 5 ft.

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* Several fish of a most poisonous quality, described by Dr. Forster, were taken by the crew of the *Resolution* at the New Hebrides; and he notices that Quiros, when here, observed that his whole ship's crew were poisoned at the same place by a fish called *pargo*. The greater part of the fish taken were, however, good and wholesome. Dr. Forster adds, that "the natives seem to be well acquainted with the poisonous quality of the fish; it would be advisable, therefore, to inquire of them whether it may be eaten with safety, and they are everywhere good-natured enough to give fair warning when there is the least danger."—*Observations*, p. 648.

The South coast of Espiritu Santo appeared to have numerous bays with small islands in them. At a short distance inland, the land rises to a great height and is thickly wooded, the country in the interior being mountainous.

Immediately North of Cape Lisburn, the coast forms a slight bay, in which there is temporary anchorage with off shore winds. H.M.S. *Rosario* anchored off this cape in 1872, and Commander Markham visited the missionary station there. H.M.S. *Pearl* anchored in 8 fathoms, fine sand, about 7 cables from the beach, with Cape Lisburn bearing S. by W. ½ W. A surf rolling in upon the beach, in calm weather, made landing difficult.

A good anchorage is procurable for small vessels on the South coast of Espiritu Santo Island, under a small island called Tanoa, N.E. of Hat Island, and N.W. of St. Bartholomew Island. Under Cape Lisburn, anchorage can be had during any months but between November and March, when strong westerly winds might set in; a swell always sets in before the wind. A missionary was stationed here, but he was attacked by the bush natives and had to leave; he reports having been able to do nothing with the natives, in the way of converting them.—*Mr. George Haddock.*

Northward of Cape Lisburn the coast is abrupt, rising in perpendicular cliffs from the sea; it is intersected by numerous ravines, and is of irregular outline, rising into numerous peaks of from 1,000 to 3,000 ft. in height, increasing in altitude as the centre of the island is approached. The hill sides are scored by watercourses, and many of the mountain spurs are destitute of trees, but the North and South sides of the ranges, as well as the valleys, are densely wooded. Anchorage may be found off some parts of this coast.

No off-lying dangers were seen from the *Pearl* off the West coast. H.M.S. *Conflict*, 1876, obtained soundings of 9 fathoms over the northern part of the shoal marked on the chart in lat. 15° 24′ S., long. 166° 30′ E.

The N.E. point of Espiritu Santo is low and covered with cocoa-nut trees. Westward of it is *Sakau Island*, about 500 ft. high, and similar in appearance to Cape Quiros, having an abrupt cliff to the northward, but a low point apparently extending from the bluff to the southward. The island is covered with cocoa-nut trees, and the channel between it and the shore is deep. At about 6 miles southward of the cape is *Port Olry*, which was examined by the *Ségond* in 1879. It is sheltered by a flat island, and affords good anchorage. Several other anchorages were found to the southward sheltered by the islands, as shown on the chart, and the *Ségond* then passed through the channel between Aore Island and the coast of St. Esprit, where anchorage was also found.

Star Peak, Pic de L'Etoile, or *Meralaba*, is the northernmost of the New Hebrides, and was thus named by Bougainville in 1768. The centre of this island, in lat. 14° 29′ S., long. 167° 50′ E., rises to a conical-shaped peak, 2,900

feet high; it is steep-to all round, except off the N.E. point, where there is a small off-lying rock. Though small, it is thickly inhabited; and cultivation extends some distance up the mountain side.

The island has been frequently visited by the missionary schooner *Southern Cross*, and yams obtained from the natives, who in appearance resemble the other inhabitants of the New Hebrides, as well as those of Banks Islands. The canoes were few and small.

BANKS ISLANDS, which lie to the northward of the New Hebrides, were discovered by Capt. Bligh, May 14, 1879, during his remarkable voyage in an open boat from Tofoa to Timor, after the mutiny of the *Bounty*. Under the circumstances in which we gained our knowledge of them, it cannot be remarkable that they were very imperfectly laid down on the charts. "The sight of these islands served only to increase the misery of our situation. We were very little better than starving, with plenty in view; yet to attempt to procure any relief was attended with so much danger, that prolonging of life, even in the midst of misery, was thought preferable, while there remained hope of being able to surmount our hardships. For my own part, I consider the general run of cloudy and wet weather to be a blessing of Providence. Hot weather would have caused us to die with thirst; and probably being so long constantly covered with rain or sea protected us from that dreadful calamity."

They were so vaguely placed on the charts, that when D'Urville passed them November 1, 1838, he was much embarrassed. His first discovery was *Merigi*, an isolated rock, which he named *St. Claire Island*, 200 ft. high, lying about 10 miles N.W. $\frac{3}{4}$ W. of Star Peak Island.

Vanua-Lava is the largest of the group; on its East side is a fine harbour discovered in 1857, by the Bishop of New Zealand, and named by him *Port Patteson*. He found the natives of the group very friendly and confiding, not having been much visited by the sandalwood traders.

Captain R. L. Hunter, of the ship *Marshall Bennett*, passed through the group in December, 1835, and could not reconcile the charts with what he saw, and thus they remained until they were more fully examined in the mission vessel by Lieut. Tilley, 1864-6, whose descriptions follow:—

SANTA MARIA, or GANA ISLAND, the second largest of the Banks Islands, lies between the parallels of 14° 12′ and 14° 22′ S., and between the meridians of 167° 23′ and 167° 36′ E. The main range of mountains, about 2,000 ft. high, lies in an East and West direction, and, excepting on the South side, where the land falls in ridges, the slopes are regular to the shore. The island is well wooded and cultivated, but during the usual trade winds landing would be very difficult—even if practicable—on the southern and eastern sides.

The information respecting this island is somewhat limited, owing to the quarrelsome nature of the inhabitants of the western side, who seldom failed to shoot arrows after the boat on her leaving the shore. This occurred at

Lakona, a village near the waterfall at the North end of the western bay, and off this place several shoal patches were observed, with clear water inside them. Steep Bluff on with White Rock Point leads clear inside the North patch, on which the least water found was 3 fathoms; and the former bluff, N.N.E., clears the patches on the outside; but great caution is necessary when approaching this locality until the character and positions of the dangers have been ascertained.

Lieut. Musters, H.M.S. *Conflict*, found good anchorage where fresh water could be obtained, northward of the S.W. point, in 7 fathoms, sandy bottom, with the black sandy beach bearing East, and the S.W. point S. $\frac{3}{4}$ W. After rounding the S.W. point, a large bay opens out, and the depths will be found to decrease gradually as the anchoring ground is approached.

The reefs off the N.E. side of the island extend out to a distance of fully three-quarters of a mile, with three openings where anchorage may be found in fine weather by steamers and small craft.

A good mark for finding *Losolava* anchorage, is the summit of Mota Island astern, bearing N. $\frac{3}{4}$ E. In entering, keep close to the reef on the eastern side of the entrance. Several rocks, with not more than 6 ft. of water over them, are scattered about different parts of the anchorage; caution is therefore necessary.—*Lieut. Carey*, H.M.S. *Conflict*, 1875.

Care is necessary when approaching the N.E. and East sides of Santa Maria at night, for distance is rendered deceptive by the low coast line being backed by high land. The island cannot be recommended to strangers for obtaining supplies, in consequence of the uncertain nature of communication with the inhabitants; they are now said to be numerous and friendly.

In addition to the anchorages on the northern side of this island, there is an anchorage for a small craft immediately to the South of East point. A passage 50 or 60 yards wide, with 7 or 8 fathoms depth of water through the reef, leads to it; but it is patchy inside. Vessels running in for shelter should anchor directly they strike 5 fathoms, when inside the reef. The circling reef round Sta. Maria does not extend so far to the S.E. as shown on the chart.

VANUA LAVA, the largest of the Banks Islands, is 16 miles in length North and South, and is a remarkable looking island, with several high rounded mountains, the highest, to the N.W., being some 2,800 ft. above the sea. In the *Suretamiti Mountain* are several hot springs, always steaming. The Port of Vanua Lava is named *Port Patteson*, in honour of the judge of that name, and father of the missionary bishop. The natives are described by Mr. Brenchley as better featured than those of most of the New Hebrides Islands. They were estimated to number 800 souls by Bishop Patteson, in 1865; are not cannibals, and acted in a friendly manner. They are now thought to number about 1,500. Glass bottles were much in demand, as by breaking these they made knives, &c. Yams may be procured in small quantities between May and August.

Water may be got from the stream in the centre of the bay, which in a measure is sheltered by a reef outside. The river, whose mouth is constantly changing, has a bar entrance, which can only be crossed by boats between half-flood and half-ebb; when inside there are two branches, the one to the right being impregnated with sulphur, but the left contains pure water, which may be baled into the boat. Quiet days are recommended for watering, as with high winds much swell is thrown into the bay. The South head should not be approached within $1\frac{1}{2}$ cable as a breaking reef was seen extending from it.

The islets of *Pakea* and *Niwula*, to the S.E. of Port Patteson, are encircled by a reef, which extends from a third to half a mile off the N.E. extremity of Niwula. A third island lies South of Niwula within the reef, and they are all covered with trees. *Dudley Channel*, between these islets and the coast, has deep water. At 3 miles S.S.W. of the South head of Port Patteson, is a small islet; the reef surrounding it appears to extend some distance to the E.S.E. and also to connect the islet with the shore.

Off the islet of *Ravena*, to the northward of the port, there is a break, and a patch of 10 fathoms lies with Ashwell Bluff, S.W. $\frac{1}{2}$ S., the North point of Ravena Islet W. by S. $\frac{1}{2}$ S., and the peak of Mota Island S.E. $\frac{3}{4}$ S.

There is also broken ground off the N.E. end of Vanua Lava, the position of which has not yet been ascertained, but by keeping on the Valua Island side of the channel it may be avoided. Nothing less than 7 fathoms has been found in passing over it.

Mr. Goodall, of the *May Queen*, reports the existence of a reef of 18 ft. water, situated $1\frac{1}{2}$ mile from the western side of Vanua Lava Island, and bearing S.E. by S. $\frac{1}{2}$ S. from the North Cascade. The reef is about half a cable in extent, and has 12 fathoms all round it. Position, lat. 13° 46′ 30″ S., long. 167° 19′ 30″ E. (approximately).

MOTA, or SUGAR-LOAF ISLAND, the head-quarters in the group of the Melanesian Mission, is 8 or 10 miles in circumference, and derives its English name from its peculiar shape. It lies about 7 miles to the eastward of Port Patteson, in lat. 13° 49′ S., long. 167° 39′ 30″ E., and attains an elevation of 1,350 ft., the summit having a peak and a shoulder, which are in line when bearing East and West. The inhabitants are quite friendly, and some of them understand a little English. The number of villages amount to 42, with an aggregate population of about 2,000, but no recognized chiefs. The weapons of the natives consist of spears, clubs, bows, and poisoned arrows. Fruit, sugar-cane, taro, potatoes, and yams, and occasionally pigs, are to be procured; the articles of barter being beads, fish-hooks (very small fish-hooks at Mota), calico, and axes.

Wood and water are not obtainable at Mota Island, which is steep-to, and landing is difficult. There is good anchorage round the island; a narrow reef fringes the shore. The best landing place is near the mission station, with the

highest or eastern peak well open North of the lower or western one. Landing was also obtained with the summit bearing S.E. by E.

VALUA or SADDLE ISLAND lies between lat. 13° 36′ and 13° 41′ S., and long. 167° 34′ and 167° 41′ E., and is about 8 miles long, N.E. and S.W. In 1875, it was reported that it appeared to be placed about 2½ miles too far North on the Admiralty chart.

The mountain range of this island runs E.N.E. and W.S.W., attaining an elevation of about 1,800 ft., with sudden declivities, especially on its North and South sides. The north-eastern portion of the island is bold and rocky, with no landing, as the sea always breaks against it, whilst the northern face has a rough coral shore, with close fringing reefs.

There is a good beach for landing at *Punui* near the N.W. point, and a good lee under the western side of the island. The precipitous hill is remarkable when seen from North or South, as its western face appears quite perpendicular.

A little South of Punui a fringe reef begins, and gradually extends off to the distance of two-thirds of a mile from the S.W. end, which is called Mot-lav, to within 2 miles of the eastern part of the island, which alone is known as Valua by the natives.

Off the S.W. end of Valua Island is the small island of *Araa*, which is readily recognised by the gap in the highest trees, and from it a reef extends to the distance of half a mile. The distance between Araa and the main island can be waded. The natives, numbering from 2,000 to 3,000, are friendly and well disposed. Yams are to be had here, as well as at the head of the large bay on the western side of Valua Island.

Rowo Reef and Islets.—This dangerous reef, enclosing 3 small islets, lies between lat. 13° 35′ and 13° 39′ S., long. 167° 29′ and 167° 31′ 30″ E., and is crescent-shaped, with the concave side to leeward. The weather side dries to a considerable extent at low water, and is always marked by a break, but the lee side is calm and smooth, and dangerous. It seems to be steep-to all round, excepting off the S.W. end, where, for about 200 yards, there is broken ground with 10 fathoms, but scarcely an advisable place even for temporary anchorage.

The reef lies nearly in the fairway when making for Bligh Island, through the channel between Vanua Lava and Valua Islands. A wreck was observed about a third of a mile off the North end of the reef, and the whaler *Bonny Doon* was wrecked near the S.E. elbow of the reef in July, 1864, but all hands were saved, and well treated by the natives.

The three islets all lie towards the North end of the reef, the southernmost and largest terminating in a sand-bank on its South side; they are all wooded, and the tops of the trees are about 50 ft. above the sea. Inside the reef there is an abundance of fish, which the natives spear and shoot. Only the northern islet, Rowo, is inhabited, the population being about 50 to 60 in number.

It is high water, on full and change, at Rowo Reef, at 6h 30m; springs rise 6 feet.

To clear the S.W. prong of Rowo Reef to the westward, Ravena Island should be kept well open of Ashwell Bluff S.E. by S. ¾ S., but this mark should not be borrowed on. To clear the reef on its S.E. side do not bring the N.W. tangent of Vanua Lava to the southward of S.W. ¼ W. From the South tangent of the reef the saddle of Araa bears E. by S. ¼ S., and the break off the North end of the reef lies with the South tangent of Bligh Island, W. ¾ S.

UREPARAPARA or BLIGH ISLAND, about 10 miles to the N.W. of Rowo Reef, attains an elevation of 1,950 ft., is nearly circular in form, and about 12 miles in circumference; it is steep-to, except a few fringe reefs close in on its lee side, is well watered, and produces abundance of taro, though but little else. The island is a remarkable instance of an extinct crater, the break in the lip being to the eastward, with the sides of the remaining portion falling steep from the summit. The South point was found to be in lat. 13° 34′ S., long. 167° 19′ E.

There is deep water at the entrance of the crater basin, but it is patchy inside, and not a place for a ship to enter; it is also an awkward place for boats with a fresh trade wind. The best landing is of course to leeward, where there are a few villages, whose inhabitants are friendly.

Heavy squalls occasonally pass over and between these islands, and with such weather a strong set is generally found between them. Tide rips were observed off the S.E. and S.W. ends of the island.

Vatu Rhandi, 25 miles N.E. ¾ N. of Urepararara, is a small islet about 250 ft. high.

TORRES ISLANDS, known also as *Baba* or *Ababa Islands*, are five in number, of coral formation and moderate height. Some patches of 6 fathoms and perhaps less have been observed E.N.E. 1½ mile from Middle Island. Commander Markham, in 1872, found the natives difficult to approach and suspicious. Anchorage may be found on the western side of the islands, by picking a suitable spot of sandy or mud bottom, in 20 fathoms, one-third or half a mile from the shore. There is little water on the islands, the natives being dependent on the milk of the cocoa-nut as their only drink. The following particular description of the islands is by Lieut. Tilley, R.N., of the Mission schooner, *Southern Cross*:—

North Island, the largest and highest of the group, lies N.N.W. and S.S.E., about 6½ miles long by 3½ broad; the S.E. end is the highest, where the land rises to an elevation of 1,200 ft., sloping in terraces toward the northern point. Off the South point is a small spit or fringe of coral, from which the land runs for about 3 miles to the N.W., where there is a small bay and beach, the South point having the usual spit off it; the land then trends northward for about

1¾ mile; when running back it forms a long shallow bay, the S.E. bight of which should be avoided, as it is shoal and patchy.

The N.W. point of the island, low, with a spit off it, lies N. by W. about 2½ miles from this shoal ground; near it is a small spring of fresh water. For about 2 miles to the N.W. of this point heavy overfalls, with a short, uneasy sea, were experienced.

A reef, which appears always to break, lies N.E. ½ E., about 1½ mile from the N.W. point, with the N.E. side of the island bearing S.E. ½ S.; a berth of 5 miles therefore should be given to this extreme of the islands.

Between Middle and North Island is a *small oval island*, about 450 ft. high, 1¼ mile long by about three-quarters of a mile broad. It is the smallest of the group, separated from North Island by a channel about 1 mile broad, apparently blocked by a reef, extending for some distance from the smaller island. If a passage exists, it will probably be found along the North Island shore. The channel between this and Middle Island is narrow and unknown.

Middle Island, 2½ miles S.E. of North Island, is of a circular shape, about 3½ miles in diameter, with a peak rising to an elevation of nearly 600 ft. The south-western coast is bold, and from the S.W. point the land runs N.W. by W. for 1½ mile, when it forms a large deep bay (*Hayter*). Abreast the South point of this bay, and near the shore, but with apparently a clear and deep passage between, is a flat rock a few feet above the water, with a little stunted vegetation growing on it. Discoloured water extended some little distance from its northern side, otherwise it appeared steep-to.

The landing-place is on the southern shore of the bay, where the natives were found to be noisy and turbulent. Soundings of 15 fathoms were obtained, but too close to the beach to call it an anchorage. The coast next trends to the northward for about 1½ mile, and then turns to the eastward.

Saddle Island, so named from its formation, which causes it to make as two islands from the S.W., lies 2½ miles to the southward of Middle Island, with a safe channel, through which the *Southern Cross* worked, experiencing a westerly set and a tide rip off Saddle Island. This island is of an irregular gourd-like shape, the N.E. part, forming Log Bay, being the stem; it is some 3½ miles long, N.N.W. and S.S.E., and about 2 miles from East to West in its widest part; the South peak is the highest, being 500 ft., and the North peak about 300 ft. above the sea. Reefs extend for some little distance from the northern shore.

The landing-place was formerly at *Log Bay*, on the weather side of the island, but a better place for communication has been found about the middle of the North face, at a white beach with cocoa-nut trees, opposite a saddle in the land. This place was called *Boat Cove*, as there was a narrow winding passage in for the boat. The natives were quiet and friendly; they make good bows and arrows, but it is doubtful whether any supplies or vegetables could be obtained from them.

South Island, lying S.E. by S. about 2 miles from Saddle Island, is flat-topped, 600 ft. high, and can be seen in clear weather some 25 or 30 miles from the deck; it is of an irregular, oblong shape, about 9 miles in circumference, steep and bluff in most places, and is inhabited.

The eastern shores of North and Middle Islands, and the western shores of Saddle and South Islands have not been examined.

Tides.—The time of high water will probably differ but little from that of Banks Island, viz., $4^h\ 40^m$.

SANTA CRUZ ISLANDS.

This group of islands was first discovered by Mendaña in 1595, but was not again seen until Carteret re-discovered them in 1767. Still we gained no complete account of them until they were examined by D'Entrecasteaux in 1793. In the atlas of his voyage, published by M. Rossel, is a good chart of them by M. Beautemps Beaupré. The group is composed of seven larger islands, Vanikoro, Tévai, Tapoua (*Edgecumbe*), Santa Cruz (*Nitendi*), Guerta, Volcano (*Tinakula*), and Lord Howe, besides several smaller ones to the North and N.E. of Volcano Island.

VANIKORO is the southernmost of the Santa Cruz group. It is an important island in the eyes of Europeans, not from its extent or riches, but from its being the scene of the disastrous loss of the two ships of La Pérouse, in 1788, an event which was not ascertained with any certainty until May, 1826, or thirty-eight years afterwards.

The Vanikoro group has but a very slender population. The coasts alone are inhabited, all the interior being only a dense forest, wild, and nearly impenetrable. The population was considered not to exceed 1,200 or 1,500, according to D'Urville. The *climate* of Vanikoro is deadly to Europeans, and does not appear much better to the natives.

The group forming the Vanikoro Islands or *La Pérouse*, as Capt. Dillon styles them, is composed of two, of unequal extent. D'Urville calls the larger of the two *Recherche*, and the smaller *Tavai*. The first is not less than 30 miles in circumference; the other is not more than 9 miles. They are both high, and covered with trees to the water's edge. Recherche is 3,000 ft. in height, and may very easily be seen at the distance of 60 miles.

The whole of the islands are surrounded by an immense reef, 35 miles in circumference, the distance of which from the coast varies from 1 to 2 miles. With the exception of some narrow passages, it is continuous throughout its whole extent, and is only interrupted in its eastern part for about 8 miles. Besides this, in the space and before the eastern point of Tevai, there is an isolated breaker, which extends more than a mile off. The general reef is

formed by beds of compact coral, left dry in parts by the tide, and on which here and there naked, blackish rocks arise, varying in height from 4 to 6, and even 8 feet.

Within the reef, and in the space comprised between it and the coast, the depth of water is generally 30 to 35 fathoms; but there are numerous coral patches scattered here and there, which reach within 2 or 3 fathoms of the surface, and render the navigation embarrassing to ships of any dimensions.

The coast itself is throughout bordered by a dangerous reef of coral. The *Paiou Beach*, at the S.W. side, and a very small space in front of *Ocili* (*Ouscelee*, Dillon) are the only points, according to the information acquired by D'Urville, which are free, and where canoes can reach the shore.

Tevai, or *Bayley Bay*, appears to be the principal bay. It is formed to the North by Tevai Island. The survey of the island by D'Urville renders the approach to the bay easy. For entering, when in the centre of the channel, steer W. ½ S. for *Dillon* or *Direction Island*, which is difficult to make out, being surrounded by high land, but may be known by its not being more than 300 or 400 yards in length, and having an abrupt elevation of about 250 ft. Nearly in the fairway between Middle Bank and the northern extremity of the fringe reef off Dillon Head, from which it is about a cable distant, is *Pearl Rock*, a coral patch about half a cable in extent with a least depth of 6 ft. on it, and on which the sea seldom breaks. From it Dillon Head bears S. by E., and the peak of Direction Island, West.

When Dillon Head, the eastern bluff point of Tevai Bay, bears S. by W. steer S.W. ½ W. for the anchorage, passing between the two reefs, awash at half tide, Deceitful and Treacherous Reefs, anchoring about 1 cable from the shore, in 20 fathoms, mud. Care must be taken not to steer to the southward of the S.W. ½ W. course, and a good look-out kept, to avoid Pearl Rock. A shore reef fringes the bight of the bay. Indifferent water can be obtained with difficulty at low water from two streams; at other times, these streams are overflowed. A dangerous looking extent of discoloured water was observed on the South shore to the East of Tevai Bay.

There is a channel, Dillon Passage, joining Tevai and Manevai Bays, so that a ship might pass to the westward in case of necessity. In the narrowest part it is not more than 600 ft. broad; and in its centre is a ledge of coral patches, with a passage on either side—that to the South is about 60 ft. broad, and 4 fathoms deep; that to the North is 90 ft. wide, with 3½ fathoms at low water spring tides. The narrowest part of the North passage is about 120 ft. in length, and by buoying it on each side a ship might pass through.

Manevai or *Lushington Bay* opens to the N.N.E., Tevai Island forming its eastern side. Its entrance, called by Dillon *Haye's Channel*, through the reef, lies nearly due North from Direction Island. The narrowest part is at its inside, leading into the bay; it is from a quarter to half a mile broad. The

weather or eastern reef, which forms that side of the channel, runs out N.E.; under its lee is smooth water The lee or West reef runs out to the N.W. From the direction the reefs take there is a large space between them, in which no danger could be discovered. Between the narrowest part of this channel and *Cape Hayes*, the N.W. point of Manevai Bay, there are five coral patches, of 1 to 2½ fathoms. They are easily avoided, and are best kept to port by vessels proceeding to sea.—(Capt. Dillon, vol. ii., pp. 261-2.)

Barrier reefs were seen to extend from three-quarters of a mile to 2½ miles off the eastern side of Vanikoro, curving round towards Point Miller of the Boussole Reef, and being broken up to the northward in detached patches. The sea was observed to break upon these reefs in parts. Discoloured water was also seen to extend about half a mile eastward of Point Miller. To clear these reefs in coming from the southward, the eastern extremity of Tevai Island should not be brought to bear to the northward of N.W. by N., until the peak of Direction Island is well open of Dillon Head, and Moembe Point bears West.

The spot where the unfortunate ships of La Pérouse, the *Boussole* and *Astrolabe*, were wrecked is at the S.W. part of the island, and on the outer reef, opposite the district of Payou or Paiou, one of the ships (the *Boussole*) was wrecked, her remains having been seen and collected both by Dillon in 1827, and by D'Urville in the following year. Some cleared ground was found in the vicinity. Here Dillon was informed that the survivors built and launched their brig. This cleared spot is manifestly artificial, and every evidence tends to confirm the truth of this. There are several passages through the reef in this part.*

It will be unimportant to follow the minute description of the reefs, passages, and points of Vanikoro scattered through the second volume of Dillon's work, because in themselves they can only afford interest from the sad event with which the island is connected.

TAPOUA, or Edgecumbe, is the next island to the northward. Carteret calls it *Ourry* and *New Alderney*, but the discordant particulars recorded of it are not worth repeating here. Capt. D'Urville places the western summit of it in lat. 11° 17′ 30″ S., long. 166° 32′ 14″ E.

The island is entirely surrounded by a reef which stretches 2½ miles from the shore. On the western side of the island there is an entrance through the reef, having a depth of 4 fathoms in it, leading into an extensive bay called *Basilisk Harbour*. There are many dangers in the entrance, which requires well surveying before it can be entered with safety. H.M.S. *Rosario* found canoes only at the S.E. end, but the natives were too timid to come off.

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* In 1883, Lieut. Benier, of the French vessel *Bruat*, made a search here, and recovered some anchors, cannon, and other relics of this ill-fated expedition, among them being a bronze cannon dated 1621. They were to be conveyed to the Louvre at Paris.

NITENDI or SANTA CRUZ ISLAND is the principal of the group; it was thus named by Mendaña, but it is probable that he thus designated the entire group, for Quiros calls it, for distinction, *La Isla Grande de Santa Cruz*. Lieut. Tilley, R.N., of the *Southern Cross*, says that Santa Cruz Island is about 15 or 16 miles in length, with fringe reefs along the shore, but apparently no off-lying dangers. The North point, near the centre of the island, was found to be in lat. 10° 40′ S., long. 166° 3′ E. The high land extends close out on its N.E. side, but towards the N.W. the hills slope at some distance from the extreme, leaving a considerable extent of low land near the coast. The island is well wooded and watered, the streams in some places running through the villages into the sea.

The natives are a fine athletic-looking race, and come off readily to the ship, bringing pigs, bread-fruit, and yams; mats, in the manufacture of which great skill is displayed, are also offered for sale. The appearance of the canoes, houses, &c., evinces great ingenuity. Canoes with outriggers, and mostly lime-washed, have a neat appearance; they have also large sea-going double canoes. The villages are large, and houses surrounded by stone fences. On the North side the villages are close to the sea, with from 300 to 400 inhabitants to each. The natives are apparently merry and good natured, but not to be trusted, as was sadly proved by the attack made on the boats of H.M.S. *Pearl*, under Commodore Goodenough, who thus describes the affair in a letter drawn up by him two days before his death :—

" I wished particularly to communicate with Carlisle Bay, where the *Sandfly* was attacked in September last year, in order, if possible, to open a friendly intercourse with the natives. I therefore steamed off the entrance of the bay in the *Pearl*, and, finding the harbour too small for the ship to enter, I took two cutters and a whale-boat into a village fronting the entrance.

" I landed with precaution, accompanied by several officers, made some presents, and bartered with a few things the natives brought down. The natives were in good numbers; several of them had put off from different parts of the beach in canoes, some of which met the boats on the way to the shore. After remaining on shore three-quarters of an hour, and feeling satisfied with the advances which had been made, I ordered the party to prepare to leave for the ship. Every person was in, or close to, the boats, except myself, Lieut. Harrison, R.M.L.I., and my secretary, Mr. Perry, when a man, standing between two huts about four yards from me, fired an arrow, which struck me on the left side. I turned at once to the boats, which shoved off, receiving at the same time two or three flights of arrows, which struck five of the men, and myself a second time, on the head.

" To stop the attack, a few shots from revolvers and rifles were fired, and the flights of arrows ceased, one native having been struck with our fire. I then proceeded on board. My first impulse was not to molest them; but, on considering the case, and being satisfied after enquiry that no person whatever

on our side gave the least provocation, I thought it better to send in four boats, and burn the village where the attack had been made."

The arrow wounds at first appeared slight, but the poison ultimately caused the death of the much respected commodore, and also of two seamen, on the 21st of August, 1875, (from tetanus), nine days after the wounds were received. A war vessel was despatched to punish the offenders, after which no vessel called here till 1880, when the missionary vessel *Southern Cross* landed Bishop Selwyn at the village of Lelouova, without mishap, and a native missionary was left.

Cape Byron, the N.E. point of the island, according to the observations of D'Entrecasteaux, is in lat. 10° 41′ S., long. 166° 4′ 30″; according to Lieut. Tilley, R.N., 1869, it is in lat. 10° 40′ S., long. 166° 0′ 30″ E., a near approximation to the former; *Cape Boscawen*, its S.W. point, is in lat. 10° 51′ 15″, long. 165° 43′ 15″. The bay, called by Carteret *Trevanion Lagoon*, and which lies on the N.W. part of the island, is the same in which Mendaña anchored the second time, and which he called *Port Graciosa*. Carteret made no survey of it; but, according to all appearance, it is in many respects preferable to any other on the North side of the island. There is only one doubtful feature, according to Carteret, that is, whether the bottom is good holding ground; but, as before mentioned, Mendaña anchored in it. The entrance is more than 2 miles broad. In front of the bay, at the distance of a mile, is an island named by Mendaña *Guerta Island*, and by Carteret, *Trevanion Island*. It is nearly 10 miles in circuit. Its North part is in lat. 10° 40′ S., long. 165° 41′ 30″ E.

Suckling Reef.—On October 4, 1873, at 11.30 a.m., from the *Renard*, when off the N.W. end of Santa Cruz Island, at about 3½ miles from the shore, with the centre of Tinakula Island bearing N. ¼ W., and the North end of Guerta Island bearing E. by N. ¾ N., a small coral patch, which dries at low water springs, bore N.W. by W. ¾ W., distant 1 cable. These bearings place the reef in lat. 10° 40′ 45″ S., long. 165° 44′ 50″ E.

Near to Cape Byron is *Port Swallow*, where Carteret anchored. *Bloody Bay* is also on the North coast, and to the West of Port Swallow. It acquired its name because Carteret's pilot and several of his crew were surprised and massacred by the natives. Between Bloody Bay and Port Swallow is *Byron Bay*, which is a lagoon inside a coral reef. The entrance may be distinguished by a small wooded islet on the reef westward of the entrance, and by some native houses on the beach opposite. H.M.S. *Rosario* visited the North coast of Santa Cruz in 1871, and was met by canoes 5 miles from the shore. She afterwards anchored in Byron Bay, and established friendly relations with the natives. The beach was found to shelve rapidly from 2½ to 24 fathoms.

The West point of *Carlisle Bay* lies a mile East of the East point of Byron Bay, and 5½ miles West of Cape Byron. In some charts Byron Bay is represented as an open bay, similar to Carlisle Bay, which is wrong. Good water

may be got from a mountain stream in Byron Bay, but it will not hold more than three vessels. Both Carteret and D'Entrecasteaux experienced a strong current to the West, near the land.

The land of Nitendi, says D'Urville, appeared to be moderately high on its eastern part, much less so in the western; it is covered with wood from the water to the summit of the mountains. *Lord Howe Island* lies off the S.E. end.

Tinakula, or Volcano Island, as it is called both by Mendaña and Carteret, is a cone rising to a height of 2,200 ft., and falling into the sea by a rapid slope. The lower portion, about one-third, is covered with a vegetation apparently most luxuriant nearest the sea. The upper part is entirely barren. No traces of inhabitants in any part. Smoke and flame were seen to be emitted from its summit, and on its S.W. side incandescent lava was seen flowing down. This volcano, seen by Mendaña three hundred years ago, seems permanently active, for when H.M.S. *Rosario* was here, in 1871, a stream of lava was flowing down the N.N.W. side. Flame and smoke were also emitted at intervals of from 10 to 15 minutes. It is in lat. 10° 23′ 30″ S., long. 165° 47′ 30″ E.

The islands to the N.E. of Tinakula have been very imperfectly described, but in 1869 they were examined by Lieut. T. C. Tilley, R.N., of the mission schooner *Southern Cross*, who gives the following account of them :—

MATEMA or Swallow Islands, forming part of the Santa Cruz group, lie to the northward of the great island, and between the parallels of 10° 4′ and 10° 22′ S., extending from long. 165° 39′ E. to 166° 19′ E., occupying an extent of about 42 miles in a W. by N. direction from *Nimanu*, the south-eastern of the group, to *Nupani*, the north-western; they are from 100 to 200 ft. above the sea, and are dangerous from the extensive reefs which stretch out especially from their western or lee sides. The inhabitants are rough and fearless, they come off eagerly to barter mats, bows and arrows, for iron, and appear to be bold navigators, sailing in their double canoes as far as Tucopia, which lies about 180 miles to the S.E.

Nimanu, the south-eastern island of the group, is in lat. 10° 21′ S., long. 166° 17′ E., and lies N.N.E. 25 miles from the eastern high land of Santa Cruz; it is a small, round, bold-looking island, some 200 ft. high, with apparently deep water all round; there is a land-slip and probable landing place on its lee side.

Panavi, the eastern island of the group, lies in lat. 10° 17′ S., long. 166° 19′ E., distant about 4 miles N. by E. ½ E. from Nimanu, to which it is similar in size and appearance, but not quite so high; it is well wooded; on the western side there is a small bight with a steep white beach; from this there appeared to be communication with the nearest part of Lomlom, the next island, about three-quarters of a mile distant.

Lomlom runs E.N.E. and W.S.W. about 5 miles long by 1¼ mile broad; it is from 150 to 250 ft. high, and forms with another island, whose name is un-

known, a smooth water bay open to the northward, the shores of which are composed of rough beaches fringed with narrow reefs. Lomlom appears to be clear of dangers except off its S.W. extreme, where a reef extends about S.S.W. for 1½ mile; the reef then trends to the northward towards the second island with several large rocks or islets within its edge.

The second island is similar to Lomlom in size, running North and South 4½ miles long by less than 1 mile wide, and between 100 and 200 ft. high; the weather or eastern side is bold, and from a bluff on the N.E. coast commences an extensive coral reef, trending first N.W. for about 4 miles to Nivluli, the next island (which it surrounds), and then runs about W.S.W. for nearly 13 miles. The villages on these islands are probably situated inland, or on the eastern side which faces the lagoon, as only one hut resembling a boat-house was seen from the sea.

Nivluli, or *Nufiluli*, lies about 1 mile from the second island of Lomlom, and is a mile long N.W. and S.E., and 120 ft. high. The reef runs close round its N.E. side, and then trends to the West and S.W. for about 2 miles, forming a bay with a low rock on the edge; a small, round islet, about 35 ft. high, lies half a mile within the reef. From the rock the reef runs to the westward. In 1880, the missionary barque *Southern Cross* visited this island; the natives were friendly.

PILENI, the next island westward of Nivluli, from which it is distant 3 miles, runs N.W. and S.E. about 1 mile in length; it is about 100 ft. high, and there is a village on its S.W. point. Pileni lies outside the great lagoon, but is surrounded by a reef, which passing close round its eastern side extends about three-quarters of a mile to the S.W. from its western shore. There is apparently a deep-water channel between the main and the Pileni Reefs.

Sand Islet is merely what its name indicates; it is small, about 10 ft. above water, and without vegetation, the natives resorting to it only to fish. This islet lies on the western side of an oval ring of coral, about 1 mile long, N.N.W. and S.S.E., similar to that of Pileni, and also without the main lagoon, and is the only example in this group of the reef extending to windward of the land to which it is attached. There is a clear space of 1½ mile between this reef and that of Pileni, and also a deep-water channel of three-quarters of a mile between it and the edge of the main reef.

The Great Reef.—From Sand Islet the western entrance of the main lagoon bears nearly S.W., distant about 6½ miles. This extreme lies in lat. 10° 14′ S., long. 166° E.; from it Tinakula bore S.W. ¼ W., 17 miles, the eastern high land of Santa Cruz S. by E. ¾ E. 28 miles, and Nukapu N. by W. ¾ W. 7 miles. From this extreme the reef trends sharp round to the eastward, forming the North side of an apparently deep-water entrance to the lagoon, between the West point and the *S. W. patch*, a reef about 2 miles long, lying S.E. by E. 3½ miles from the point.

Eastward of the S.W. patch, with an apparently deep-water channel 1½

mile wide between them, lies another narrow patch of coral nearly 3 miles long; between this and the reef from Lomlom Island is a third patch, the channels on either side into the main lagoon appearing to be deep, and apparently leading to a secure anchorage under the lee of the northern Lomlom Island, the coast of which appeared to be beach, with villages built near it. The interior of the main lagoon seemed to be patchy, but little could be distinguished from the masthead of the *Southern Cross*.

The current was found setting to the S.W. along the North side of the reef, and overfalls were experienced off its western point.

Matema, the only island on the southern side of the great reef, lies about midway between Lomlom Island and the West point, being nearly 6 miles on a W. by N. bearing from the southern extreme of the Lomlom Reef. It is a small inhabited island, 100 ft. high, shaped like a boot, and surrounded by a reef which extends about one-third of a mile from the coast, the landing being on the western side. There is apparently a narrow passage between this island and the middle coral patch of the main reef.

Nukapu, the scene of the outrage on Bishop Patteson and his companions, on September 20th, 1871, lies to the N.W. of the Great Reef, and bears W.N.W. about 8 miles from Sand Islet. It is narrow, about 120 ft. high, and nearly 1 mile long, N. by W. and S. by E., with a low termination to the southward, where appeared to be the villages. A reef encircles the island, passing close to its eastern shore, but extending about $1\frac{1}{4}$ mile from its western side. The murder of the good bishop is attributed to revenge on the part of the natives for wrongs inflicted by a "labour vessel." Subsequently to this, H.M.S. *Rosario* visited the island. A boat party sent ashore was most treacherously received, and burnt a village in retaliation. The natives here understand the Maori language. They have stone breastworks constructed, which, together with the thick bush, offer them a safe retreat. The *Southern Cross* approached the island in 1880, but no signs were seen of the natives, and a landing was not attempted.

Anologo and Nupani, the western islands of the Matéma group, are similar to Nukapu in size and shape. They are surrounded by an extensive and irregularly shaped reef, which, passing close to their eastern sides, stretches out to the S.W. for nearly 3 miles from Anologo, the southern of the two islands.

Anologo lies W. $\frac{3}{4}$ S. about 17 miles from Nukapu, running East and West about 1 mile long. It is nearly 120 ft. high, and is situated in the eastern angle of the reef surrounding the two islands.

Nupani lies N.W. $\frac{1}{2}$ N. about 2 miles from Anologo, the reef forming a bight between; it runs North and South about 1 mile long, and 120 ft. high, the northern point being in lat. 10° 4′ S., long. 165° 40′ E. The reef passes close along the East and North sides of Nupani, from whence it trends to the west-

ward for half a mile, then sweeps round to the southward and eastward for 2½ miles, from whence it stretches out to the S.W., forming a large and dangerous bight of smooth water nearly 4 miles between the horns. This S.W. angle of the reef which breaks lies S. by W. 3½ miles from Nupani, S.W. 2¾ miles from Anologo, and is in lat. 10° 8′ S., long. 165° 39′ E. From this point the reef runs East 2 miles to its S.E. extreme, which lies South, distant 1½ mile from Anologo; the sea breaks heavily along this part of the reef. The natives appeared to be friendly.

DUFF or WILSON GROUP was discovered by Quiros and Torres, 1606, who gave the name *Tuamaco* to the principal island, but they do not appear to have given a name to the group collectively. The islands were again seen at 8 a.m., September 25th, 1797, by the ship *Duff*, Capt. James Wilson.

"The largest of this group (Tuamaco) we named *Disappointment Island*, and the whole cluster, Duff's Group; they are about eleven in number, lying in a direction S.E. and N.W., 14 or 15 miles. In the middle are two larger islands, about 6 miles in circumference; between these last is a small islet, and to the eastward are three islets, two of which are round and high, the other flat and longish. On the N.W. part of the group are five or six more, some of them high. At the East end of one is a remarkable rock, in the form of an obelisk. The small islands are apparently barren, but the two largest are entirely covered with wood, among which are several cocoa-nut trees, but, on the whole, they had not the appearance of great fertility. The natives appeared stout and well made, copper-coloured, and resemble Polynesians. They were about 350 in number at the time of the visit of H.M.S. *Basilisk*, in 1872, and the only permanently inhabited island was Disappointment Island, the village being situated on a coral islet off its S.W. side. The *Basilisk* anchored 1½ mile off shore, with the village bearing N.E. ½ N., but dragged with a N.E. breeze."

From an examination made in the *Duke of Portland*, in April, 1849, these islands consist apparently of volcanic rocks, the easternmost being columnar, and covered with trees. To the westward of Tuamaco, the largest, there was apparently a wide channel between it and a small islet next West of it. The North island of this group was observed by Lieut. Suckling, of H.M.S. *Renard*, in 1873, to be in long. 167° 4′ E., or 11 miles to the eastward of the usually assigned position, which must therefore for the present be considered doubtful. The British ship *Isle of Wight*, in 1871, reported the centre and apparently highest island (150 to 175 ft.) of the group to be in 9° 48′ S., long. 167° 10′, which nearly agrees with Lieut. Suckling's position.

Mr. Fuller, of the *Hallie Jackson*, reports a shoal with 4 fathoms on it, and probably less, about 15 or 20 miles westward of the Duff Group, the shoal extending North and South for about 3 miles. A bank of 8 fathoms was reported in 1882, about 25 miles to the S.E. of these islands.

Patteson Shoal, in lat. 9° 40′ S., long. 166° 10′ E. (approximate), was reported by the mission schooner *Southern Cross* in 1871.

Brougham Reef, to W.N.W. of it, is in lat. 9° 30′ S., long. 165° 30′ E.

To the North of the Fiji Archipelago, and eastward of the New Hebrides, lie a number of scattered islets and shoals, which remain to be described to complete the list of those between latitudes 10° and 20° S., and which do not belong to either of the large archipelagoes which we have just described. To the North of them are the Ellice Islands, described in a future section.

Isabella Shoal, discovered by Mr. John Pearson, of the American ship *Isabella*, February 20, 1832, with a depth of 16 fathoms, coral bottom, is in lat. 12° 25′ S., long. 177° 15′ W. It extended East and West as far as the eye could reach.

Adolph Bank, of 16 fathoms, sand and rock, lies in lat. 11° 55′ S., long. 178° 0′ W.

Bayonnaise Bank was found by Capt. Tromelin, May 24, 1828. His soundings were 16 fathoms, coral bottom; after running 2 miles from his first cast, the bottom could not be reached. Lat. 12° 8′ 30″ S., long. 179° 43′ 30″ W.

ROTUMAH, Rotuam, or *Grenville Island*, was discovered by Captain Edwards, in his search for the mutineers of the *Bounty* in 1791. It was also visited by Captains Duperrey and Chramtschenko. More recent information is obtained from the reports of Capt. Hope, H.M.S. *Brisk*, 1866, and of Capt. J. Moresby, H.M.S. *Basilisk*, 1872. In 1880 it was annexed to the British colony of Fiji by request of the native chiefs. The population numbered about 2,150 at the census in 1881, and are friendly. The island is fertile and the climate suitable for the growth of sugar, coffee, cotton, &c. There are large numbers of pigs on the island. There is a Roman Catholic Mission near the village of Pepsei, on the South side.

Rotumah is about 8 miles long East and West, by 2 miles broad, and of moderate height. Its shores are fringed with reefs, which project farthest off the East point, where they run off to the northward fronting Epipigi village, and south-eastward fronting Epipigi Peak to the distance of 1¼ mile; there are some islets and rocks on these projections. *Epipigi Peak*, in the S.E. part of the island, is in lat. 12° 30′ 10″ S., long. 177° 4′ 40″ E.

Emery Island is the easternmost of a chain of islets and rocks about 2¾ miles long N.E. and S.W. lying to the N.W. of Rotumah, and is about 700 ft. high, wooded, and inhabited. The channel between these islets and Rotumah varies from 1⅓ to 3 miles in width and should be avoided; the passages between the islets are also said to be unsafe. The westernmost islet of this chain has a remarkable perpendicular cleft right across it, through which the sea passes. Near the East point is *Atangota Island*.

M. Dutaillis says that the island is called by the natives Rotuam, and has two roadsteads on its northern part, equally good or bad, according to the season. That of *Oïnafé* was for a long time the only one used, and still has the greatest number of ships to visit it, because this village is the residence of the king and chiefs; but more provisions may be found in the *Bay of Fao*, where you may enter as in the first, by the assistance of the natives.

The South end of Rotumah terminates in a low point, at the end of which a conical hill rises, which seems to form a separate islet. The tongue of land which unites the two islands has not been formed for any great length of time, for the natives still speak of the "two islands." The shore is covered with villages touching each other, and the population is very numerous.

Ituutu is the residence of the superior of the mission. In the season of the northerly winds you may anchor on the coral patches lying in front of the village, and on which there is a depth of 7 to 11 fathoms. On the tongue of land which forms the southern part of the bay of Fao is the second establishment of the missionaries.—*M. Dutaillis.*

Captains Hope and Moresby, R.N., give the following account of the two roadsteads on the North side, which are mentioned above.

Fao Bay, or *Lee Harbour*, as it is called, is an open bay, about 1½ mile from the West end of the island. It is well marked by a high wooded bluff, 600 ft. high, on its western side, with a precipitous red sandstone face to the water's edge. There is no fresh water, and landing can only be effected at high water. The *Brisk* anchored here in 15 fathoms, with the East point of the bay bearing N.E. ¾ E., and the centre of Emery Island W. by N. ½ N.

Oinafa Bay, or *North-east Roadstead*, is about 5 miles to the eastward of Lee Harbour, at the N.E. point of the island, and is close to the westward of two islets lying off the point, which are connected to each other and to the main island by a coral reef. The *Basilisk* anchored here in 9½ fathoms, sand, with Outer Islet bearing N.E. by E., and Emery Island W. ½ N. In this position with a strong trade wind blowing, the water was smooth, and the ship was watered in bulk from good wells and a smooth sandy beach; at the same time in Lee Bay a considerable swell was rolling in, and an extensive shore reef extending across the bight of the bay would have rendered landing at low water difficult. It is high water, on full and change, at $6^h\ 15^m$; the rise is 5 to 6 feet.

At all seasons when the trade wind may be depended upon the N.E. roadstead is to be preferred to Lee Bay; but the latter, the superior roadstead, has the advantage that, if the wind should be blowing from the northward or westward, a sailing vessel would more readily clear the land. In making Lee Bay, ships must avoid closing the eastern point, as off it extends an extensive reef.

Care also must be taken, when making the land from the eastward, to distinguish the two islets off the N.E. roadstead from two similar islets off the eastern

extreme of Rotumah Island; these small islets are from 150 to 200 ft. in height, and covered with cocoa-nut trees.

Strangers looking for these anchorages are likely to experience some difficulty, when making the land from the eastward, as Emery Island bears a striking resemblance to the high wooded bluff that marks the western extreme of Lee Bay, and appears in front of the mainland and may be mistaken for the bluff itself. Oinafa Bay is nearly opposite the village of Epipigi; and Fao Bay fronts the villages of Maftoa and Itu-utu. There is also anchorage on the South side of Rotumah, 1½ mile westward of the S.E. islet, in 15 to 18 fathoms, half a mile from the edge of the reef, and fronting the village of Noatas; but it is considered indifferent. Here there is a boat passage through the reef.

Eagleston Reef.—About 40 miles E. by N. of Rotumah is a shoal of unknown extent; the information respecting it was given to Mr. Forbes, of H.M.S. *Hyacinth*, by Capt. Eagleston, of the American ship *Salem*. This would be in about lat. 12° 20′ S., long. 177° 50′ E.

Louisa Bank, of 13 fathoms, discovered in 1859, is said to be in lat. 11° 45′ S., long. 175° 52′ E.

Hamond Reef is in lat. 15° 32′ S., long. 175° 20′ E., according to Capt. (afterwards Sir A. S.) Hamond, H.M.S. *Salamander*. It is probably the same as *Underwood Reef*, placed in lat. 15° 42′ S., long. 175° 18′ E.

Carter Reef is stated to be in lat. 15° 42′ S., long. 176° 28′ E. The ship *Balmoral* also discovered a dangerous reef in lat. 15° 40′ S., long. 175° 58′, and this report was confirmed by a German notice, which states that the reef breaks with a heavy swell on. Depth of water 7½ fathoms. These three are possibly the same.*

Another *reef* was reported to lie in lat. 18° 10′ S., long. 175° 10′ E., but was not seen by Capt. Fox, in the *Mary Catherine*, in November, 1854.

Hazel Holm Bank, reported to lie in lat. 12° 44′ S., long. 174° 4′ E., and to have 18 fathoms over it, was passed over by the barque *Hazel Holm* in March, 1880. Soundings were obtained in from 19 to 23 fathoms for 3 miles in a S. by E. direction after the bank was discovered.

Charlotte Bank and *Pandora Bank*.—The English vessels *Scarborough* and

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* Onaseuse, or Hunter Island, was stated to have been discovered July 20, 1823, by Capt. Hunter, in the ship *Donna Carmelita*. Its extent was not stated, but it was reported as well peopled, well cultivated, and of volcanic origin. Capt. Hunter procured a quantity of yams, fruit, and some hogs. The natives were friendly, and all had their left little finger cut off at the second joint, and their cheeks perforated; spears 24 to 40 ft. long. Reported position, lat. 15° 31′ S., long. 176° 11′ E. It has been proved, however, not to exist in or near this position, as, besides several merchant vessels, two of H.M.Ss., the *Rosario* in 1870 and 1874, and the *Blanche* in 1875, passed over its supposed position in the day time, with clear weather, and saw nothing of it. It has been suggested that it may be the same as Niua-fu, in long. 175° 41′ *W.*, through an erroneous assumption of East for West longitude. See also note on p. 528.

Alexander discovered, June 4, 1788, a bank, on which the lead gave 15 fathoms. It extended far to the West, where, it was thought, there was probably an island, for a great quantity of birds took their flight towards that direction. Admiral Krusenstern places this bank, the Charlotte Bank, in lat. 11° 50′ S., long. 173° 12′ E. The *Pandora* frigate discovered a bank of 11 fathoms, in lat. 12° 11′ S., long. 172° 5′ E. It is not unlikely but that these two may join, like many others of the reefs of these seas, which are not isolated reefs, but composed of numerous separated portions. It may also be supposed that the birds might have been taking their course towards the latter reef.

FATAKA, or Mitre Island, was discovered by Capt. Edwards, and was also visited by the Russian captain, Kroutcheff, in 1822, who describes it as 2 miles long, N.W. and S.E. It is steep, covered with wood, and consists of two hills and a rock, giving it the appearance of a mitre. Capt. Goodwyn says, that when seen from the eastward it appears like two separate haycocks, both of the same apparent height, but the one to the southward more rugged than the other. It is bare of vegetation, and the high rock on its North side looks like a ship under sail. Capt. Kroutcheff places its S.E. point in lat. 11° 56′ S., long. 170° 20′ E., and says it is uninhabited; it is now considered to be in long. 170° 10′ E.

ANOUDA, Annula, or Cherry Island, according to the same authority, is in lat. 11° 35′ S., long. 170° 0′ E. Capt. Edwards places it in lat. 11° 37′, long. 169° 40′ 30″. Commander Markham visited the island in 1871, in H.M.S. *Basilisk*, and procured fruits from the natives, who were quiet and hospitable, but no missionary resided with them. They have no pigs nor fowls.

The hill at the North end of Anouda rises to a height of 350 ft. A rock lies off the North end of the island, about 300 yards from the bluff, and from the same point a bank of 19 to 12½ fathoms extends 4 miles in a north-westerly direction. It has anchorage on it, with a bottom of coarse white sand. From the S.W. side of the island another spit extends off. A mile from its southern end is a rock a few feet above water, joined to the shore by a rocky bank. A quarter of a mile outside this is an apparently isolated sunken rock. The island is 1½ mile in diameter, and approached from the eastward is best rounded on its North side. The *Basilisk* anchored off the S.W. end in an open roadstead exposed to a heavy swell. The inhabitants belong to the Polynesian race, and have long straight hair.

Strathmore Shoal.—On December 4th, 1856, the barque *Strathmore*, Capt. John Mann, after sighting Mitre and Cherry Islands, is stated to have passed over a shoal with from 4 to 5 fathoms over it. The bottom could be seen very distinctly, sand and rocks. It was not more than 150 yards in extent, in about lat. 11° 9′ S., long. 170° 42′ E. Its existence in this position is doubtful.

TUCOPIA, or Barwell Island, it is supposed, was discovered by Quiros, and derives its second name from the vessel which next saw it, in 1798. It was subsequently visited by Capt. Golownin, and also by Capt. Tromelin, in

1828, and still later by Dillon and D'Urville. It is a small island, 3 miles in diameter, in latitude 12° 21′ 10″ S., long. 168° 43′ 30″ E., according to Tromelin.

It was supposed that all these three last-named islands did not exist, two or more being identical with each other; but they have all been visited, and their positions fixed as above.

Tucopia is small and high, in the form of a compressed cone, with precipitous cliffs round the East side, and some lofty trees thinly scattered on the ridge at the southern extremity. When it bears South the island assumes the shape of a saddle; the N.E. end, much the highest, extends longitudinally to the S.W. Its altitude is computed to be 3,000 feet.

Tucopia, or, as it is called by D'Urville, *Tikopia*, is somewhat triangular in shape, and may be 7 miles in circumference; from the East to the West points about 2 miles; from the S.W. to the N.W. points from $1\frac{3}{4}$ to 2 miles; the other side, between the East point and the N.W. point, about 3 miles. It can be approached with safety all round, is of considerable height, and may be seen at the distance of 40 miles in clear weather. Supplies of all kinds, such as yams, cocoa-nuts, &c., are scarce and dear. A ship may anchor with the point of the reef which lies off the S.W. part of the island bearing S. by W., the N.W. part of the island bearing N.E. $\frac{1}{2}$ E., and the landing-place or bluff head E. by S., in 27 fathoms, 2 cables off shore, bottom of coarse sand and shells. Immediately outside of these there is from 50 to 100 fathoms. The inhabitants do not exceed 400 or 500 in number, and are Polynesians of a friendly character.

It was on Tucopia that the remains of the expedition of La Pérouse—the sword-hilt, &c.,—were found, which led to the discovery of the site and particulars of the wreck on Vanikoro Island.

Having described the islands and groups which lie between the parallels of 10° and 20° S., we proceed to those which lie between that and the equator, commencing with the easternmost archipelago, the Galapagos Islands.

CHAPTER XVI.

GALAPAGOS ISLANDS.

The Galapagos Islands are a group lying on the equator, extending $1\frac{1}{2}^{\circ}$ on each side of it, and about 600 miles from the West coast of the Republic of Ecuador, to which they belong.

Dampier, who visited them in May, 1684, says:—"The *Spaniards*, when they first discovered these islands, found multitudes of guanoes (iguanas) and land-turtle or tortoise, and named them the *Galapagos* Islands. I do believe there is no place in the world that is so plentifully stored with those animals. The guanoes here are fat and large as any that I ever saw; they are so tame that a man may knock down 20 in an hour's time with a club. The land-turtle are here so numerous, that 500 or 600 men might subsist on them alone for several months, without any other sort of provision; they are extraordinary large and fat, and so sweet, that no pullet eats more pleasantly."

The surveys of Capt. FitzRoy, in the *Beagle*, have given us a very accurate knowledge of their condition; and therefore from his description, combined with the interesting observations of Mr. Darwin, and of Dr. Seemann, who came here with Captain Kellett in the *Herald*, Jan. 1846, we chiefly derive the following.

There are six principal islands, nine smaller, and many islets, scarcely deserving to be distinguished from mere rocks. The largest island, Albemarle, is 60 miles in length and about 15 miles broad, the highest part being 4,700 ft. above the level of the sea.

The constitution of the whole is volcanic. With the exception of some ejected fragments of granite, which have been most curiously glazed and altered by the heat, every part consists of lava, or of sandstone, resulting from the attrition of such materials. The higher islands generally have one or more principal craters towards their centre, and on their flanks smaller orifices. Mr. Darwin affirms that there must be, in all the islands of the archipelago, at least 2,000 craters.

These are of two kinds— one, as in ordinary cases, consisting of scoriæ and lava, the other of finely stratified volcanic sandstone. The latter, in most

instances, have a form beautifully symmetrical; their origin is due to the ejection of mud, that is, fine volcanic ashes and water, without any lava.

Climate.—Considering that these islands are placed directly under the equator, the climate is far from being excessively hot,—a circumstance which, perhaps, is chiefly owing to the singularly low temperature of the surrounding sea. Excepting during one short season, very little rain falls, and even then it is not regular; but the clouds generally hang low. From these circumstances the lower parts of the islands are extremely arid, whilst the summits, at an elevation of 1,000 ft. or more, possess a tolerably luxuriant vegetation. This is especially the case on the windward side, which first receives and condenses the moisture from the atmosphere. Dampier states:—"The air of these islands is temperate enough, considering the clime. Here is constantly a fresh sea-breeze all day, and cooling refreshing winds in the night; therefore the heat is not so violent here as in most places near the equator. The time of the year for the rains is in November, December, and January, then there is oftentimes excessive hard tempestuous weather, mixed with much thunder and lightning. Sometimes before and after these months there are moderate refreshing showers; but in May, June, July, and August, the weather is always very fair."—(Vol. i. p. 108.) Capt. FitzRoy says:—"I can add nothing to this excellent description, except that heavy rollers occasionally break upon the northern shores of the Galapagos, during the rainy season above mentioned, though no wind of any consequence accompanies them. They are caused by the 'Northers' or 'Papagayos,' which are so well known on the coast between Panama and Acapulco."

During the rainy season, or from November to March (which is not, however, at all to be compared to a continental rainy season), there are calms, variable breezes, and sometimes westerly winds, though the latter are neither of long duration nor frequent.—*Capt. FitzRoy.*

The rainy season among these islands is said to commence in January and last until the beginning of April; sometimes, however, for two or three consecutive years the fall of rain is inconsiderable, so that this season is more characterised by the cessation of the S.E. trade wind. During these months calms prevail, varied by occasional squalls from the North and N.W., accompanied by thunder and lightning, which, however, is said never to reach the eastern islands, but is attracted by the higher land of Albemarle and Narborough Islands. These squalls are not heavy or of long duration. The long calms and strong currents in the vicinity of these islands during this season render the navigation for vessels under sail hazardous and difficult.

From the middle of April to the end of December the trade wind blows with regularity, and gales are unknown.—*Comm. Cookson*, H.M.S. *Peterel*, 1875.

Currents.—One thing for which the vicinity of this archipelago may be distinguished, is the remarkable currents which surround it; and, as before

mentioned, may have considerable influence on the climate.* There seems to be a great similarity in this respect between the Galapagos and the Islands of Fernando Po, Princes, and Anno Bom, in the Bight of Benin. Both series are somewhat similarly situated (and perhaps physically constituted) in reference to the general systems of winds and currents, and both are notable for the strength and velocity of the surrounding streams. Around the Galapagos they usually run to the N.W., and with the velocity of from 2 to 5 miles per hour; but these are not probably very constant in their position or direction, for streams of different velocity, direction, and temperature, traverse in contrary directions the prevalent current. The difference in temperature, indicative of the origin of these different veins of water, is remarkable. On one side of Albemarle Island Captain FitzRoy found the temperature of the sea, a foot below the surface, 80° Fah., but at the other side it was less than 60°, evidently showing that one was owing to the cold current, coming from the southward, along the Peruvian and Chilian coasts, and the other coming from the coasts of Mexico and Panama.

A curious instance of this meeting of the waters was observed on board H.M.S. *Havannah* on her passage from Callao to Central America, at noon of the 29th of April, 1856, about 200 miles E.N.E. of the Galapagos, when she ran through a rippling extending N.W. and S.E. as far as could be seen, and most distinctly marked, the water to the southward being of a greener colour. Before entering it the temperature of the sea was 72° Fah., a quarter of a mile farther inside, or North of the rippling, it rose to 78°, and 3 miles more to the northward it was 80°. Until this time the *Havannah* had experienced a set to the N.W. by W. of 39 miles in 24 hours, but on the 30th the current was only 9 miles in the same direction.—*Captain T. Harvey, R.N.*

But upon this important subject we shall reserve the further observations for the section devoted for that purpose.

The islands belong, as before stated, to the Republic of Ecuador, of which they form a department. In 1832, Don José Villamil (or Willimi) bought two of the most southern of the group, of which one was Charles Island. He then founded on it, at his own expense, a colony of free men and women, selected from the prisons and profligacy of Guayaquil. These he employed in cultivation, fishery, &c., and he called his colony on Charles Island, *La Floriana* (or *Floriade*), in compliment to General Flores.

At the time of the *Beagle's* visit, in September, 1835, the settlement in the uplands of Charles Island consisted of nearly 200 souls, most of whom were convicts. In 1872, six men resided here who hunted cattle for their own

* Colnett was disposed to believe that these islands were the general rendezvous of the spermaceti whales from the coasts of Peru, Mexico, and the Gulf of Panama', who came there to calve. Young spermaceti whales were seen in great numbers in April (1794). The singular nature of the currents may bear upon this subject.

consumption chiefly, as the island is only visited about once in six months by a vessel. The terrapin, or land tortoise, for which the islands are celebrated, are now said to be nearly exterminated.

Water can be found on many of the islands in the rainy season, but Chatham Island is the only place that can be depended on.

In 1875, these islands were visited by Commander Cookson, in H.M.S. *Peterel*. At that time Chatham Island was occupied by an Ecuadorean firm, employing the inhabitants, 37 in number, in the cultivation of fruit, vegetables, and sugar-cane. Charles Island had about 26 inhabitants, mostly engaged in cultivating the orchilla weed, which was the chief article of export.

H.M.S. *Triumph* visited Charles Island in 1880, anchoring in Post Office Bay. The island was found to be uninhabited, having been abandoned in 1878; the cattle and other animals belonging to the former settlers were relapsing into a wild state. The other islands were also supposed to be uninhabited.*

ALBEMARLE ISLAND is the principal of the group, and lies to the westward. The survey of Capt. FitzRoy exhibits every feature of it. It is a singular mass of volcanic ejections, about 60 miles in length by 15 miles in width. Six volcanoes have there raised their summits from 2,000 to 4,000 feet above the ocean, and from them immense quantities of lava have from time to time flowed towards the sea; so that this island, large as it is, may be literally described by saying that it consists of six huge craters, whose bases are united by their own overflowed lava. The southern side, which is exposed to the trade wind and completely intercepts it, with all the clouds it brings, is thickly wooded, very green, and doubtless has fresh water; but how is that water to be obtained when such a swell rolls upon the shore?

Four small islets, the remains of volcanoes, lie near the low S.E. extreme of this island, which, with *Brattle Islet*, are extremely useful in warning vessels of their approach to a very dangerous piece of coast. So low are the south-eastern extremities of Albemarle Island, that they are not discernible until you see the surf on the shore. A heavy swell setting towards the land, and generally light winds, add to the danger of getting near this coast; but there is anchorage in case of necessity.

Point Essex, the S.W. cape, is high, and to the North of it is Iguana Cove, in which the *Beagle* anchored. "It is a small cove; but such a wild-looking place—with such quantities of hideous iguanas as were quite startling. Passing a low projecting point (called by the buccaneers *Christopher's Point*), our eyes and imagination were engrossed by the strange wildness of the view; for in such a place Vulcan might have worked. Amidst the most confusedly heaped

* An interesting account of this visit, by Capt. A. H. Markham, R.N., will be found in the "Proceedings of the Royal Geographical Society," December, 1880, pp. 742-755.

masses of lava, black and barren, as if hardly yet cooled, innumerable craters or fumeroles) showed their very regular, even artificial-looking heaps—like immense iron works on a Cyclopean scale.

"When this lava flowed from the heights, it must have been stopped rather suddenly (cooled) by the water; for the lava cliffs are in some places 20 ft., and in others 40 ft. high, while close to them there is water so deep that a ship could not anchor there, even in a calm, while the sea is quite smooth."

Elizabeth Bay, which received its name from the buccaneers, is a very extensive bay between the South side of Narborough Island and the southern part of Albemarle Island. At the bottom of it is *Perry Isthmus*, which is the junction between the higher southern and northern portions of Albemarle Island.

NARBOROUGH ISLAND, which forms the North side of Elizabeth Bay, is exactly like a part of Albemarle—a great volcano, 3,720 ft. high, whose base is surrounded by an extensive field of lava; it is utterly barren and desolate. A few mangroves on the sandy beaches near Albemarle Island are not seen in the distance; neither are there enough of them even to diminish the dismal appearance of the island. Colnett thought that it was the highest land among the Galapagos; the apparent point of division between it and Albemarle is so low in both that he was in doubt whether they were separated.

Tagus Cove, on the East side of the North part of the strait separating Albemarle from Narborough Island, was first described by Capt. Pipon, who commanded H.M.S. *Tagus*. It is the crater of an extinct volcano, and its sides are so steep as to be almost inaccessible. Within it there is snug anchorage in 6 to 14 fathoms.

About half a mile S.E. of the South entrance point of Tagus Cove, and a few feet above high-water mark, a small supply of good fresh water may be obtained from some pools in the rocks situated at the mouths of two narrow steep gullies, which extend to the water's edge, where there is a fair landing. —*Commander Cookson.*

Banks Bay, so named by Colnett in honour of Sir Joseph Banks, lies to the northward of Narborough Island. Its North point, which is the N.W. point of Albemarle, was named by Colnett *Cape Berkeley*. The western side of Narborough Island is very steep-to, no bottom being found with 150 fathoms of line at half a mile from the shore. There appears to be no anchorage near this or Cape Berkeley.

The northern point of Albemarle Island is *Albemarle Point*, distant 17 miles from Cape Berkeley. In the northern part of the island is one of its volcanoes, of which, Capt. FitzRoy says, the black streams of lava that have flowed in every direction down the sides of the mountain looked like immense streams of ink.

At 15 miles from Cape Berkeley, and the same distance from Point Albemarle, is *Redondo Rock*, which is thus 11 miles from the shore. It is a high,

barren rock, 85 ft. high, about a quarter of a mile in circumference, and has soundings in 30 fathoms a quarter of a mile off.

Culpepper Island is the northernmost of the group, its summit being in lat. 1° 39′ 30″ N., long. 92° 3′ W. It is 550 ft. high, a rocky, barren little island, similar to Wenman Island, 20 miles to the S.E. of it. There is a reef off its S.E. extreme.

Wenman Island is the centre of an extinct volcano, and is 830 ft. high, small, and quite barren; correctly speaking, there are three islets and a large rock, near each other, which at a distance appear as one island, but they are fragments of the same crater.

Abingdon Island is the next in succession. It was called Earl of Abingdon Island, and was well known to the buccaneers. Its summit, 1,950 ft. high, is in lat. 0° 34′ 25″ N. It is a small island, high towards the South end, being tolerably covered with stunted wood; at this part is the only bay or anchoring place in the island. The North end is low, barren, and one entire clinker, with breakers stretching out to a considerable distance.

This island was chosen by Capt. Basil Hall, as being near the equator, for the site of the pendulum experiments, the object of his voyage, in January, 1822. The western face of the island presents a cliff nearly perpendicular, and not less than 1,000 ft. high. Capt. FitzRoy says it is a fine, bold-looking cliff, considerably higher than any he saw in the Galapagos; it exhibits the rude stratification of lava, tufa, and ashes, which characterises the fracture of ancient volcanic mountains.

There is fair anchorage in 7 to 15 fathoms, sand and rock, 3 to 4 cables from the shore, abreast of the cliffs, nearly 1,000 ft. high, on the West side of the island, at about 1½ mile North of Cape Chalmers. Making this anchorage from the South, if Cape Chalmers be rounded within a mile, which can be done with safety, a green patch will be seen nearly at the foot of the highest part of the cliff, off which, and 2 or 3 cables to the North of it, is the anchorage; soundings, however, will not be obtained until within half a mile of the shore. Landing can be effected about 1½ mile to the northward of the anchorage.—*Commander Cookson.*

Bindloe Island lies next to Abingdon Island. Its southernmost summit, 800 ft. high, is in lat. 0° 18′ 50″ N. It has an irregular hilly surface, partially wooded, but, like the rest, is a mass of lava, and indicates sandy mud.

Tower Island, in lat. 0° 20′ 0″ N., is different from all the other islands of the archipelago, being low and flat. It rises to 211 ft. high.

James Island derives its name from the Stuarts, the reigning family at the time of these islands being first much frequented. The Sugar-loaf, 1,200 ft. high, at its western end, is in lat. 0° 15′ 20″ S. It is a high, large, and well-wooded tract of ground, or rather lava.

Although there is abundance of water on the higher parts of the island, so broken and dry are the lower grounds that it does not arrive at the shore; at

two places only can enough water for even a boat's crew be procured in the dry season, and for a ship there is scarcely hope of a sufficiency. On this island is a salt lake, a circular crater, from which this useful article can be procured. Capt. FitzRoy found a party of settlers on it from Charles Island, who were employed in salting fish and extracting oil from the terrapin. This oil is of exceedingly good quality, and of a light colour, being very like pure olive oil.

The best anchorage is in *James Bay*, on the West side of the island, to the northward of the highest land of the island, a remarkable sugar-loaf, before mentioned. Vessels may anchor here in 14 fathoms within a mile of a sandy beach, with Albany Island, an islet off a crater at the North extreme of the bay, bearing N. by W. *Sulivan Bay*, at the East end of James Island, is another anchorage, but it is open, with deep water. It is high water, on full and change, in James Bay, at $3^h\ 10^m$, the rise being 5 ft.

Jervis Island lies 3 or 4 miles South of James Island. There is anchorage on the N.W. side of it, where whale-ships sometimes refitted. Ships may anchor here, and send their boats straight over to James Island for terrapin and turtles, there being no anchorage on the South side of the latter island.

Duncan Island has deep water all round it, and it has no harbour; but there is anchorage for vessels drawing 12 or 13 ft. in a small creek on the North side of the island. It appears bluff and barren on all sides.

INDEFATIGABLE ISLAND (or *Duke of Norfolk Island*) is the next to James Island, and is the third in magnitude of the group. It is about 24 miles in length East and West, and 17 miles wide North and South. There is good anchorage in *Conway Bay*, at the N.W. end of the island; it is formed by a group of small islands on the North, by the island on the East, and on the South by a high rocky island or islet. The bearings from the *Conway's* anchorage were—the North extreme of Duncan Islet, W.S.W.; the extremes of the islet, S. $\frac{1}{4}$ E. and S.W. $\frac{3}{4}$ W.; and the West extreme of *Guy Fawkes Group*, N. $\frac{1}{4}$ W., in $7\frac{1}{4}$ fathoms, sand. Two ships' lengths inshore of this berth is the outer edge of a flat extending out from the beach. Vessels sailing into this bay should take in their light sails, as very strong puffs of wind frequently blow over the land. There are two reefs of rocks extending off the South side of the island, which should not be approached nearer than 2 miles by strangers. There is good landing for boats, and abundance of terrapin and turtles might be procured.

Barrington Island was so named by Colnett, with Duncan and Jervis Islands, after the three admirals. The shores are bold and fronted by cliffs; the more elevated parts appear to be level, and rather woody. The summit at its West end is in lat. 0° 50′ 30″ S., long. 90° 10′ W.

CHARLES ISLAND, though one of the smallest of the group, is one of the most important, because upon it was the principal settlement, *La Floriana*, or *Floriade*, as mentioned in the early part of this description. The site of the settlement lies inland, behind *Black Beach Road*, and is not seen in passing

along the coast. It was called Charles Island, after the Stuarts, by the buccaneers.

Charles Island, 24 miles in circumference, is peculiar in its outline; for a succession of round-topped hills, precisely similar in shape, though different in size, shows on every point of view. This exact similarity is very remarkable. The highest and largest of these hills rises 1,780 ft., the next about 1,500 ft.; the rest are of various smaller heights. The northern sides of the island are wooded; but the wood looks as brown as that on the lower parts of Chatham Island.*

Post Office Bay, on the N.W. side, is sheltered, easy of access, has excellent anchorage, and only wants fresh water to make it a most desirable place for shipping. Its name is the result of a custom established by the whalers; a box was placed on a post to receive letters, and homeward-bound ships examined the addresses, taking with them all which they might have the means of forwarding; but since the island has been peopled the box has been empty, for letters were left at the settlement. The pathway to this is pointed out by a boat-shed in a small sandy bay. H.M.S. *Reindeer*, in 1872, anchored in 9 fathoms with Onslow Island bearing N.E. by E., open of the East point of the bay. It is high water, on full and change, at $2^h\ 10^m$; springs rise 5 to 6 ft.

Black Beach Road, on the West side of the island, is an open anchorage, its only advantage being that it was near the settlement. The best landing place is at a dilapidated hut, about 4 miles from Post Office Bay, and 1½ mile from the site of the settlement.

Black Beach Road affords good anchorage in 10 to 20 fathoms, sandy bottom, 3 to 5 cables from the shore, fairly protected from the swell by several small reefs lying between it and Saddle Point. Vessels should not anchor in less than 10 fathoms, to avoid a rock with 6 ft. water on it, lying some distance from the shore. The highest peak of Charles Island, bearing E. by S. ¾ S., will lead to the anchorage, and well to the southward of the 6-ft. rock. Landing is always practicable on a small sandy beach between the black rocks, and a plentiful supply of firewood can be obtained here.—*Commander Cookson.*

The S.W. extreme of the island is not inaptly named Saddle Point. There does not appear to be any anchorage along the South shore. Off the eastern end are some islets, of which the two largest were named by Colnett after Admirals Gardner and Caldwell. All these islands are volcanic, and about 3 miles E. by S. ½ S. of Gardner Island is a dangerous breaker.

Hood Island is the southernmost of the group. It may have been known in early times, but as Colnett, who first described it, could not identify it with

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* The beach at Charles Island has been called *Pat's Landing*, from an Irishman who lived alone on the island eighteen or twenty years, with occasionally a sailor or two, deserters from the ships touching. He was killed in attempting to bring a wife off from Guayaquil. —*Coulter's Adventures in the Pacific*, Dublin, 1845, p. 42.

former accounts, he called it after Lord Hood. Capt. FitzRoy says it is small, neither high nor low, rugged, covered with small sunburnt brushwood, and bounded by a bold rocky shore. Some small beaches of white sand are visible here and there.

It lies 27 miles from Chatham Island, is small, round, and 640 ft. high. *Gardner Bay* is an anchorage on its N.E. shore, inside an island of the same name, 160 ft. high, but care must be taken of a 14-ft. patch lying near the centre of the bay, on which H.M.S. *Magicienne* struck in 1857. It is a pin rock, with 8 and 5 fathoms close-to, lying in the centre of a line joining the horns of the bay, and may be avoided by keeping close to the shore of the small island at the eastern part of the bay.

MacGowan Reef is a very formidable danger, lying in a line from Charles Island to Chatham Island, and rather nearer the latter, with the peak of Hood Island bearing S.E. ½ E., 22 miles. There is no warning given by the lead of this shoal, 50 fathoms being found within 1½ mile of it.

When Capt. FitzRoy first saw it on the horizon it hardly differed from the topping of a sea; once only in about 10 minutes it showed distinctly. One rock at the West end is just awash, but there is another under water, except in the hollow of a swell, about half a mile to the eastward, which is exceedingly treacherous.

CHATHAM ISLAND, the easternmost of the group, is 19 miles long N.E. and S.W., by 8 miles broad. *Mount Pitt*, its eastern summit, is 1,650 ft. high. It is of considerable importance to shipping, from the fact that it is the only island of the Galapagos where ships can water at all times of the year. It is also an interesting portion of the group, inasmuch as it is frequently the land first made in the passage from the South American coast.

Freshwater Bay, in which is the watering place, is an open roadstead on the South side of the island. The anchorage is in 20 fathoms, and quite secure, being about 4 cables off the watering place, a fine stream falling from a lava cliff about 30 ft. high; ships well provided with ground-tackle may lie here and water without difficulty or danger. *Wreck Point*, the S.E. extreme of the island, has a small cove to the northward of it, in which is the settlement—a collection of huts; about 4 miles inland are two plantations, at which most tropical productions are raised with ease. There is good landing in the cove, and *Dalrymple Rock*, a singular islet, 65 ft. high, lies 2 miles to the northward of it.

Wreck Cove affords good anchorage for small craft, but should be approached with caution, as reefs extend some distance from the shore near the cove and towards Wreck Point. The currents off Wreck Point are said to be strong and uncertain in their direction; H.M.S. *Peterel*, in June, 1875, when at a distance of 3 to 5 miles off shore, found the current setting to windward against a strong S.S.E. wind.

Stephens Bay, having good anchorage in 10 to 12 fathoms half a mile from

the shore, is 6 miles to the N.E. of Wreck Point. This may be easily known by Kicker Rock, 400 ft. high. *Finger Point*, on the N.E. side of the bay, is a remarkable pinnacle, 516 ft. above the sea. *Terrapin Road* is an open anchorage on the N.W. side of the island, with 12 and 14 fathoms half a mile from the shore, and *Hobbs Reef* is a dangerous ledge extending over a mile from the N.E. point.

As Capt. FitzRoy's description of it is complete, we will transcribe his narrative :—" September 15th, 1835. A number of little craters (as they appeared to be),* and huge, irregular-shaped masses of lava rock, gave a strangely misleading appearance to the lower parts of the island; and when first seen through that indistinct glimmer which is usually noticed over land on which a hot sun is shining, were supposed to be large trees and thick wood.† . . . . The S.W. part of the island is low and very rugged. We landed upon black, dismal-looking heaps of broken lava, forming a shore fit for Pandemonium. Innumerable crabs and hideous iguanas started in every direction as we scrambled from rock to rock. Few animals are uglier than these iguanas; they are lizard-shaped, about 3 ft. in length, of a dirty black colour, with a great mouth, and a pouch hanging under it, a kind of horny mane upon the neck and back, and long claws and tail. These reptiles swim with ease and swiftness, but use their tails only at that time.

17th.—Weighed and stood along shore, sounding. There was good anchorage until near the S.W. point of Stephen's Bay, off which the water is shoal, and the bottom uneven.‡ We anchored in Stephen's Bay (on the N.W. side),

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* Mr. Darwin, too, in reference to these remarkable features of these singular islands, says;—" One night I slept on shore, on a part of the island where some black cones, the former chimneys of the subterranean heated fluids, were extraordinarily numerous. From one small eminence I counted sixty of these truncated hillocks, which were all surmounted by a more or less perfect crater. The greater number consisted merely of a ring of red scoriæ, or slags, cemented together; and their height above the plain of lava was not more than 50 to 100 ft. From their regular form they gave the country a workshop appearance, which strongly reminded me of those parts of Staffordshire where the great iron foundries are most numerous."—Page 455. See also Colnett, page 51.

† " This glimmering haziness is at all times a great impediment to making accurate measurements of an object, when both it and the observer's eye are near the ground. Raising either some few feet higher remedies the inconvenience, which was much felt when using a micrometer for measuring a base."—R. F.

‡ *Wreck Bay* was inhabited (1848) by a native of Guayaquil, called here General Mena, and a person of the name of Gurney, who called himself an Englishman. They maintained themselves by supplying the American whalers with terrapins, and having exhausted the shores of these animals, they sought them in the interior, which they describe to be generally much more fertile than near the coast.

The French brig of war *La Genie*, in August last, dug a well through the clay, the lava being only superficial, but it was too near the beach, and the water in it, and in the ponds described by Capt. Kellet, I found to be quite salt.—*Admiral Sir George Seymour, K.C.B., Journal of the Royal Geographical Society*, 1849, page 21.

and found an American whaler lying there. The bay is large, and the anchoring ground generally good; but the landing is bad at low water. There is no fresh water; and it is frequently difficult to enter as well as to leave, because, unusually becalmed by high land, it seldom feels the true wind. *Enderby Cove* is only fit for a boat; at low water it is full of rocks.*

Kicker Rock is a curious mass of stone, 400 ft. high, rising almost perpendicularly from the bottom of the sea, where it is 30 fathoms deep, and in the offing (to the North of the West point) is another (called the Dalrymple by Colnett), which looks exactly like a ship becalmed with all sail set. Seeing a remarkable hill at the N.E. side of the bay, which had not an appearance like other parts of the island, I went to it in a boat, hoping to find water near the foot, and to have a good view from the summit. Disappointed in both ways, the hill being composed of crumbling sandstone and almost inaccessible, I returned to the ship early next morning.

20th.—At daylight we were off the S.E. part of the island, and continued working to the S.W. during the forenoon, along a shore quite bold, excepting the small rocks above water in "Middle" Bay. At noon, seeing a small cove, I went in a boat to examine it and look for water. We found no signs of any in that place; but a little farther West a fine stream was seen falling from a lava cliff, about 30 ft. high. We landed on a stony beach in the cove, half a mile westward of the cascade, and found a fine stream of excellent water; two others were likewise seen, but they were inaccessible. This is the only watering place throughout the year.†

We have thus described all the islands of this singular group, and in these descriptions we may have been more diffuse upon matters not strictly nautical than may be absolutely necessary for a work like this; but as they form one of the most remarkable, among many singular, features of the Pacific Ocean, they cannot but be interesting. Whether they are considered in the physical

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* In a valley in the middle of Chatham Island, Dr. Coulter states that he discovered *coal* in large quantities, extending away under the hills, and says that an immense supply of it might be obtained. "It quickly ignited, flamed up, and burned after the cheerful manner of Kendal (query, Cannel) coal."—*Coulter*, pp. 106-7. But how did this coal exist through the volcanic eruptions beneath it?

† The anchorage at the watering place is quite secure, though it appeared strange to remain in such a spot, only 3 cables' lengths from a surf upon a steep cliff shore. The great S.W. swell is broken by Hood Island, and the southerly trade wind is so moderate that no harm is to be apprehended from it. Upon this point, however, Rear-Admiral Sir George Seymour says:—"The *Beagle* and *Daphne* here completed their water in 1832 and 1845; but from the swell that sets on the shore, if large ships frequented these islands, I think it would be necessary to bring water to them in a tank-vessel, and to some sheltered anchorage, instead of leaving them exposed to the difficulty of getting under weigh from this place, when they must lie close to the shore, and on the weather side of the island."—*Journal of the Royal Geographical Society*, 1849, page 21.

formation so distinct to the low coral groups which dot this vast expanse of waters; the strong and devious currents which surround them, varying so much from other portions of the great ocean; the active volcanic agency everywhere visible; their position on the equator; their importance to shipping for the supplies they afford, and the very singular nature of these supplies; the Galapagos Islands—the "Tortoise Archipelago"—must be evident as one of the most interesting features of the globe.

CHAPTER XVII.

THE MARQUESAS ISLANDS, ETC.

The Marquesas Archipelago is composed of two tolerably distinct groups, lying in a general N.W. and S.E. direction, between the parallels of 7° 50′ and 10° 34′ S., and long. 138° 25′ and 140° 45′ W. They are all of volcanic origin, very high, and may be seen in clear weather when 50 or 60 miles distant.

The sovereignty of the group was ceded to France by a treaty with Admiral Du Petit Thouars, in May, 1842, and a military colony was established in Taiohai Bay, at Nuku-Hiva, but the result was in no way commensurate with the expense of the establishment; and thus, after 17 years the experiment lasted, it was abandoned on January 1st, 1859. Surveys of the principal islands and harbours of the group have lately been made by various officers of the French Navy.

The southern group was the first discovered, and the honour of this event is due to Mendaña, who, in 1595, named them the *Islas de Marquesas de Mendoça*, in honour of the Viceroy of Peru, who had despatched this expedition. *Madalena*, or the southernmost island, was the first landfall of Mendaña. The following is an account of their discovery :—

In 1594, King Philip II. of Spain sent a letter to the Viceroy of Peru, the Marquis de Cañete, recommending the encouragement of enterprises for new discoveries and settlements, as the best means to disembarrass the land from many idle gentry. In the following year an armament of four vessels, with 378 men, was fitted out for the purpose of forming a settlement at the island of San Christobal, one of the Solomon Islands. Alvaro de Mendaña, who had discovered these islands twenty-eight years before, was then in Peru, and was appointed to the command of the expedition, with the title of Adelantado (nearly synonymous with Excellency).

They left Payta, in Peru, June 16th, 1595, and on July 21st discovered an island, which Mendaña named *La Madalena*, greatly rejoicing at having made, as he supposed, so quick a passage to the Solomon Islands, of which he took it to be part. His first interviews with the natives were peaceable and cordial, but a piece of brutality by one of the soldiers led to an outbreak and to a

slaughter which reflects no great credit on the character of Mendaña. They soon came to the conclusion that they were not the islands they were in quest of. The Adelantado took possession of them (at Port Madre de Dios, July 28), after prayers, in the name of the King of Spain, naming the group Las Marquesas de Mendoça, out of respect to the Marquis de Cañete, and the islands Taou-ata or Santa Christina, Hiva-oa or La Dominica, Motane or San Pedro, and Fatou-hiva or Santa Madalena.

The other island of the S.E. group is Hood Island, or Fetugu, or Fatou-houkou. It was discovered by Cook, in 1774, and named by him after the young midshipman who first announced it. This person was afterwards a celebrated man—he became Lord Hood.

The N.W. group consists of six islands—Oua-pou, Roapoua, or Adams Island; Oua-Houka, Houa-houna, or Washington; Nuka-Hiva, or Marchand, the principal; Motu-iti, or Hergest; Eiao or Hiau, and Fattuuhu, or Hatou-tou, the north-westernmost. This group has sometimes been called by a distinct name—the *Washington Islands*, and are thus described by Krusenstern; but in considering the isolated position of the whole archipelago, their similarity of character, the language, manners, and appearance of their inhabitants, all unite in removing any idea of their being separate groups. For this reason it is but just that they should be named, generally, by the title applied by their first discoverer, the Marquesas de Mendoça Islands, or more simply and now usually contracted to the Marquesas.

This N.W. group was not discovered until many years after the rest, in 1791, by Capt. Ingraham, of the American trader, *Hope*, of Boston. A few weeks after, Capt. Marchand, in the French ship *La Solide*, also discovered them, and, taking possession of one, called it Marchand Island. He named all but one, Uahuga, or Oua-huka, and called the whole group *Iles de la Revolution*. In the next year Lieutenant Hergest, in the transport *Dœdalus*, surveyed them accurately, and named his harbour Port Anna Maria, or Nuka-Hiva. Vancouver named them, in consequence, *Hergest's Islands*, after his unfortunate friend, who was murdered, as well as Mr. Gooch, the astronomer, at Oahu, one of the Sandwich Islands. In 1793, Captain Josiah Roberts, of the American ship *Jefferson*, gave them the name of *Washington Islands*, a name also applied to Uahuga by Ingraham, their first discoverer; and this is their title to this name.

The Marquesas, although of volcanic formation, have no active volcanoes, and do not appear to be subject to earthquakes. They are all very high, and the land is very irregular and broken. The greater part of the mountains forming the axis of the islands are in the interior, and from them ramifications extend to different points of the coast, forming ravines or valleys, more or less fertile, in which the different tribes composing the population are established. The possession of these valleys was one of the causes of the incessant wars which they carried on.

The *natives* of the Marquesas have often been described. They do not seem to have any form of government, each tribe living separately and independently. The only tribe of distinction is that of *ariki*, generally translated chief, or king, but it means only the superiority of riches. They do not appear to have any religion or worship, although some of their traditions and customs have evidently some hidden meaning. The law of *tabu* is well known and respected, and enters largely into their customs. From there being no general law or government, the only appeal from an injury is to arms, hence the great number of quarrels and wars which agitate the community. At different periods various missionaries have essayed to establish themselves here, but with little success. This is in great part owing to the bad example and advice of the white deserters from passing vessels, who are found among them, living in the same manner, and aiding in their disputes and wars. For a great number of years Dominica (or O-Hiva-oa) was the most disturbed by warfare of all the islands. They are very warlike, but they are only passionate cowards, and were said to be cannibals. The Roman Catholic missionaries have effected some good in civilizing them.

The one great feature which distinguishes these natives in the eyes of Europeans is their unbounded licentiousness. The women, by some elevated to the highest standard of beauty and grace, by others considered on the ordinary level of the race, appear to have not the slightest idea of chastity or delicacy. Their whole conduct, gesture, and motive appeared directed to one end. Their character has often been pourtrayed, and must be familiar to all readers of the Pacific voyages. It is a point, too, which ought to weigh much with the commander who would bring his ship here.

Nukahiva or Marchand is the principal of the Marquesas Islands, and Tai-o-hae, on its South side, is now the principal settlement. The whole of the Marquesas Islands are, from the character of the soil, peculiarly adapted for growing South-Sea-Island cotton; the cotton is sent either to New Zealand or to San Francisco, for trans-shipment to Europe. The great drawback against agriculture amongst these islands is the want of labour, the natives being indolent and disinclined to work, and the uncertainty of rain; a recent drought lasted for fourteen months. In all the inhabited islands there are pigs, goats, and fowls living wild.*

A line of American schooners, fore and aft rigged, having a contract with the French government for carrying the mails, run monthly from San Francisco to Tahiti, calling at Tai-o-hae, making the passage to the latter place in seventeen days, and thence to Tahiti in four or five days. The return passage from Tahiti direct to San Francisco is accomplished in twenty-seven to thirty-

* These islands were visited by the yacht *Wanderer*, owner Mr. Lambert, during her cruise round the world, in 1880-1882. She also visited the Society, Fiji, Navigator Islands, &c. See "The Cruise of the *Wanderer*, R.Y.S.," published in London, 1883.

three days. These schooners bring as cargo, lumber and sundries, returning with cotton and fungus, the latter article being for the Chinese market.

The climate of these islands must always be very sultry, the temperature seldom or never falling below 73° Fah. Notwithstanding this it appears to be very healthy, and the Europeans who have dwelt here state that it cannot be more so, an assertion which is justified by their appearance.

The winter months, as is always the case between the tropics, constitute the rainy season; but this is said not to continue long in these islands, ten months and more, frequently passing without a drop of rain. When this unfortunately happens, a general famine ensues, attended by the most dreadful consequences, and inciting the inhabitants to acts of a more horrible nature than any other people can afford an example of.

The *reigning wind* between these islands is the S.E. trade wind, which varies some degrees either to the East or South; S.W. winds, are however, felt here, and blow for a tolerably long continuance, when the inhabitants of these islands avail themselves of it, to visit their neighbours to the S.E. (Krusenstern). At the larger islands land and sea breezes usually set in.

From April to October the S.E. trade wind, called by the natives *tua-to-ha*, prevails in the vicinity of the islands. Its general direction is E.S.E., but it veers and hauls between East and S.S.E. During the rainy season the wind comes from more to the southward, and fresh S.S.W. winds with squalls are experienced, lasting three or four days. From October to April the prevailing wind, called by the natives *tiu*, is from E.N.E., veering and hauling between East and N.N.E. It sometimes gets to the westward of North, when it is apt to turn into a gale. Gales, however, are of rare occurrence.

The *current* generally sets to the westward, between W.N.W. and W.S.W., and its velocity is usually about half a mile an hour.

FATOU-HIVA, or La Madalena, is the southernmost of the Marquesas, and was the first discovered, on the eve of St. Magdalen's day, by Mendaña. It is about 8 miles long North and South, and 4 miles broad. Its S.S.W. end, or *Venus Point*, is in lat. 10° 30′ 40″ S., long. 138° 41′ 45″ W. Immediately to the N.E. of this is a delicious valley at the bottom of a pleasant bay, *Omoa*, or *Bonrepos Bay*, before which there is anchorage. At 4 miles to the North of this is a second equally pleasant valley, *Hana-vave*, or *Vièrges Bay*, which seemed to be as well peopled. At the back of this is a high and remarkable mountain, very much peaked, 3,670 ft. high.

Commodore R. A. Powell sighted it June 8th, 1867, to the westward at 40 miles off. He says the eastern side of the island is extremely rugged, steep ridges coming down from the central mountain, and terminating in high precipes over the sea. On the North and South sides of the island, the land sloped more regularly towards the sea, but there was no landing.

Point Venus, on the South side, is a perpendicular rocky cliff, about 700 ft. high, overhanging the sea, which breaks within a few yards of its base; from

some points of view the break assumes the appearance of a reef extending out farther than it really does. *Bon Repos Bay* is immediately round Point Venus, on the western side of the island, and the best anchorage is about one-third of a mile from the shore, in 17 fathoms, opposite a shingly beach, with the valley well open; or farther in, in 9 or 10 fathoms, with a peculiar pinnacle rock, one-third of a mile inland and named *Pierre Bonhomme*, bearing East, and $1\frac{3}{3}$ cable off shore.

This bay is open to westerly winds, which, according to the native account, blow occasionally with great force from December to March, which would appear to be the bad months. A heavy surf rolls continually on the beach, but landing can be effected on the rocks on the North side of the bay, or in the S.E. angle. Water can be obtained, but with difficulty, as boats must lay a considerable distance from the beach where the stream comes down.

Fruit of all descriptions is to be procured in sufficient quantities to refresh a large ship's company; but meat and vegetables are very scarce, pigs and poultry being the only animal food.

The French have practically given up all control over the natives, whose only intercourse with foreigners is confined to the crews of the few whalers that occasionally call for supplies. They are to all appearance in the same primitive state that they were described to be in over one hundred years ago, for though some have Polynesian Bibles, and all profess Christianity, they still practise the same heathenish rites, and entertain the same superstitions as formerly, whilst cannibalism yet exists in connection with prisoners of war. There were about 350 inhabitants in 1880, and they are said to be decreasing in numbers.

Hana-vave, or *Virgins Bay*, is smaller, but very similar to Omoa Bay. There is anchorage in 22 fathoms, $2\frac{1}{4}$ cables from the head of the bay, with a good watering place on its South side.

Thomasset Rock, discovered by the *Ariane*, in 1844, is placed $16\frac{1}{2}$ miles E. by N. $\frac{3}{4}$ N. from the N.W. point of Fatou-hiva, and about 13 miles N.E. by E. of its easternmost point. It is only 13 ft. above the water, and requires the greatest caution.

Motane, San Pedro, or *Mohotani*, is high, and extends N.N.W. and S.S.E., about $4\frac{1}{2}$ miles in length. It is wooded on its summit, which is 1,640 ft. above the sea, and in the ravines. At the S.S.E. point there is a large, high, isolated rock, in lat. 10° 0′ 40″ S., long. 138° 48′ W., between which and the land there is a channel so narrow that it could only be attempted by boats. The island has no fixed inhabitants.

La Solide Bank was said to extend 13 miles due South from San Pedro, with 10 fathoms, rocky bottom, over a portion of it, and 18 fathoms, rock, at its South end; but by the survey of Capt. G. Pierre, of the French navy, 1875, this appears to be all deep water, no bottom being found at 164 fathoms.

Taou-ata, or Santa Christina, is 8½ miles long North and South, and from 1¼ to 5 miles in breadth. A narrow ridge of hills, of considerable height, extends the whole length of the island, the highest summit being 3,280 ft. high. There are other ridges, which, rising from the sea, and with an equal ascent, join the main ridge. These are separated by deep narrow valleys, and watered by fine streams of excellent water.

The inhabitants were estimated at about 300 in number in 1867, but at 450 in 1880. Cattle are abundant.

The Bay of *Madre de Dios*, or *Vaitahou*, which Cook named *Port Resolution*, is situated near the middle of the West side of Santa Christina, and under the highest land in the island, and is one of the best anchorages in the S.E. portion of the Marquesas group. The French settled in this bay in 1842, and there is now a Jesuit mission here. The South point of the bay is a steep rock of considerable height, terminating at the top in a peaked hill, above which you will see a pathway leading up a narrow ridge to the summits of the hills. The North point is not so high, and rises with a more gentle slope. They are about half a mile from each other, in the direction N. by E. and S. by W. In the bay, which is half a mile deep, and has from 34 to 12 fathoms water, with a clean sandy bottom, are two sandy coves, divided from each other by a rocky point. In each is a rivulet of excellent water. The northern cove, *Vaitahou*, is the most commodious for wood and watering. Here is the little waterfall mentioned by Quiros, Mendaña's pilot; but the village is in the other cove, *Hanamiai*, or *Amiai*. There are several other coves, or bays, on this side of the island; and some of them, especially to the northward, may be mistaken for this, therefore the best direction is the bearing of the West end of La Dominica.

Santa Christina Island was sighted by Commodore Powell, R.N., on June 10, 1867, and he says that from the excellent description given in Findlay's Directory, no difficulty was found in taking the *Topaze* into Resolution Bay, where she anchored in 26 fathoms, with Dominica West Point bearing N. 21° W., the North point of the bay N. 10° W., the South point of the bay S. 11° W., and the extreme of land S. 16° W.

The *Topaze* remained here two days without experiencing any difficulty from the swell, or squalls from the mountains. There is no doubt, however, that a heavy swell sets in from the S.W.

The landing place (constructed by the French authorities at considerable expense) was washed away, and there were other marks of destruction by the waves. It was also reported that vessels had been driven to sea by the force of the violent gusts down the valley, and altogether the bay has such a bad character that whalers seldom visit it, although it is believed to be the only place where it would be advisable for ships to anchor.

The formation of the island, with its steep shore on the East, and numerous valleys on the West sides, closely resembles Madalena Island, and the facilities

for watering and obtaining supplies are about the same. There are wild cattle on the mountains, but difficult to get at, and still more difficult to carry away when shot. The inhabitants of this island are far inferior in appearance and manners to those of Madalena Island.

Other anchorages exist on the same side of the island as Resolution Bay, off the valleys of *Hapatoni* or *Abatoni* (*Friendly Cove* of Marchand), *Anatefau*, and *Anaaiti*, to the southward of Resolution Bay; but they are of small extent, very close to the shore, and the valleys to which they correspond offer no facilities for watering ships.

Bordelaise Channel, so named by D'Urville, to commemorate the voyage of Capt. Roquefeuille, is 1½ mile wide in its narrowest part, and separates Tahou-ata from Hiva-oa; both sides are clear and safe. The coast of Hiva-oa is steep and barren; that of Tahou-ata has some small open coves, with sandy beaches. The depth between is 35 to 39 fathoms; the current is nearly always to the West, at the rate of 2 or 3 knots, and it is almost impossible to beat through it to windward. However, after a week of N.W. winds an easterly current of 3 miles an hour has been observed.

HIVA-OA, or La Dominica, is the most fertile, the most populous (about 2,500 inhabitants in 1880), and the most important for its productions of the whole archipelago. It is about 22 miles long E. by N. and W. by S., and 5 miles in its average breadth.

Above *Cape Balguerie*, its eastern point, the hill rises to the height of 1,280 ft., and at its foot are several isolated rocks, the northernmost of which is in the shape of a truncated cone. The North coast, to the West of this, is a barren cliff, or white sandy beach, without shelter or inhabitants for 5 miles. At this distance is *Pouamau* or *Périgot Bay*, which may be known by its wooded amphitheatre and the mountains around it, the western one of which is 2,820 ft. high. The hill on the East side is surmounted by an obelisk or column composed of two tall vertical rocks. There is anchorage in the bay in 9 fathoms, with the rocks off the East point bearing North. On its eastern side are three detached rocks. It is open and exposed from N.N.W. to E.N.E., and has always a strong swell, especially in the season of the N.E. winds. From October to March it is better to keep under sail than to come to an anchor here. There is difficult landing on a sandy beach at the head. The bay is very populous, but has few resources. On its shore is a Roman Catholic mission, which owns a good many sheep.

The next bay to the West has neither bread-fruit trees nor cocoa-nut palms; a little further is *Nahote*, also open to the North. *Hanahi* is the second bay from the last, and affords anchorage to small vessels. After this come *Hanapaue*, *Hanaiapa*, and then *Hanatekua*. Hanaiapa has anchorage in 10 or 11 fathoms, said to be fit for large vessels, and is 13 miles from the East point. At about a mile West of this bay, there is a large cascade falling over the steep cliffs.

Hana-menou is 4½ miles from Hana-te-kour, and near the N.W. point of Hiva-oa. It is a double bay separated by a high cliff of dark rocks like an enormous tower. The bay is much used by whalers, and may be recognised, even in the night, by the cliff above named. There is anchorage in the eastern bay, which runs in half a mile, and is about 2¼ cables wide. At a cable's length off the beach there is 4½ to 5 fathoms, but near the head it is shoaler. It is said that the sea is never dangerous in the bay, but it requires good moorings. The natives houses are built round the bay, but the unhappy people have been constantly intoxicated since they were taught to extract spirit from the floral envelope of the cocoa-nut. There is an excellent watering place at a stream, which falls over a cascade in the western part of the bay.

The western shore of the island is very high, and nearly perpendicular. On the South side are some small bays in the coast which forms the South side of the peninsula, to the North of which is *Taua*, *Vy-py-hay*, or *Traitor's Bay*. This is extensive, and is separated from *Atuona*, to the North of it, by the islet *Hanake*, about 100 or 120 ft. high. Commodore Powell, R.N., says the landing is good, and water can be obtained with ease; ships of 1,000 tons could refit here with great facility. To the West of Atuona is *Taa-hou-kou*, a good but little known harbour, running to the northward, and is the best of the three bays which constitute the large indentation on the S.W. of Hiva-oa. There is good anchorage in it, 9 fathoms in mid-channel, off a small cascade which falls at its head. The highest point of the island is to the rear of these bays, being 4,460 ft. in height.

To the eastward of Traitor's Bay is the small cove of *Punahe*, 1 mile East of Taa-hou-kou, and a mile further is *Hanamate*, or *Roquefeuille Bay*, which offers temporary anchorage only. The East point of the latter is a bluff cape, covered with iron-wood trees, which separates it from *Hanahehe*, or *Sandal Bay*, which, like the others, ought to be used with caution. From this it is about 12 miles to Cape Balguerie, the East point, the coast consisting of a wall-like cliff of considerable height. The currents generally run to the westward to the South of Hiva-oa, but they pass around Traitor's Bay, and then shoot off from its S.W. point.

The French have no settlement on Dominica, but there are two or three priests on the island, one of whom stated that they had entirely failed in making converts, and that in his opinion there was not a native Christian. He also described the inhabitants as being inveterate cannibals, always at war with each other, and much addicted to drunkenness and other bad habits. The priests had succeeded in cultivating cotton, and had lately sold their produce for £2,000. It was extremely difficult to arrive at any correct estimate of the number of inhabitants, but they were said to amount to about 2,500 in 1880. The men are tall and able-bodied, but the women are degraded and ill-looking.

Fatou-houkou (*Feto Hougo*), **or Hood Island,** 18½ miles N.W. by N. ½ N. from Cape Balguerie, was discovered on board Cook's ship, the *Resolution*, in 1774, by a midshipman who was afterwards Lord Hood. Capt. Krusenstern saw it from 38 to 35 miles distant. It is lofty (1,180 ft.), but not of great circumference. It consists of a single high, and, at the summit, almost flat rock, with a gentle inclination from North to South. On the northernmost point there is a division, not very distinct, between the two hills. In Cook's chart there are a number of small islands marked on the South side, but Krusenstern could not see them, but instead he saw some on the N.W. and West sides. D'Urville says that a mile to the N.N.W. of it is a rock *beneath the water*, which it will be prudent to avoid, because it broke, though the weather was not bad. At 1½ mile N.W. of its West point the depth is 13 fathoms.

" Hood's Island, when bearing S. by E., distant 26 miles, has the appearance of a very lofty barren rock, of square form, with a hummock on each side of its base. The Marquesans on board our ship gave it the name of *Fetúku*, described it as *uninhabited*, and questioned the possibility of effecting a landing upon its shores. Canoes from the neighbouring islands occasionally resort to its coast for fish."—*Bennett's Whaling Voyage.*

OUA-POU, Uapoa, Ua-pu, or Roapoua Island, is what Ingraham calls *Adam's Island.* The officers of *La Solide* called it *Marchand Island*, and Roberts calls it *Washington Island.* Like all the rest of the archipelago, it is of volcanic origin, and is of a more picturesque appearance than any other of the Marquesas. In its central part are some curious peaks, resembling a group of church spires at a distance. Its population was estimated by Lieut. Jouan, in 1856, at about 1,200, At the census of 1880 it was 430. The Roman Catholic mission then had about 1,500 sheep on the island.

Roapoua, or *Trevennen Island* of Lieut. Hergest, is about the same size as Tahou-ata, and equally rocky, elevated, and bold. It is 7½ miles in length N.W. by N. and S.E. by S. The summits of many of its mountains present conspicuous columns, spires, or pinnacles of rock. Its highest point, in the North, is 3,905 ft. Its S.E. extremity is remarkable for a table mountain, topped on each side by a lofty spire; on its South side there are three islets of volcanic rock, which have been named from their respective forms, *Church Island*, *Gunner's Quoin*, or *Ile Plate*, and *Sugar-loaf*, or *Obelisk*, besides other names.

The western side of the island abounds in populous villages, and affords several convenient anchorages, though the island is generally but little known or frequented. One of the two most convenient anchorages is situated off a village on the S.W. coast, *Akatau*, *Amis Bay* of M. Tessan; the other is *Port Jarvis*, on the western side, a small bay, affording anchorage in 18 fathoms, with convenient supplies of wood and water.

Off the N.E. point are two barren islets, with a dangerous boat passage in-

side them. To the North of them, at 1½ to 2 miles, the depth is from 17 to 23 fathoms, sand and madrepores.

To the West of these islets in the second bay is *Akahau*, where the French missionaries have (or had) their principal establishment. It has a very bad anchorage on coral bottom, close to the sandy beach. Thence the coast runs W.N.W. for 2 miles to a flat islet off the northernmost part of the island. Just to the westward of this are two slight bays, each with a sandy beach, and separated by a rocky point. The easternmost, *Aneou*, has no inhabitants nor supplies, but has tolerable anchorage. *Hakahe-tau*, the next bay, may be known by a white patch on the cliffs. There is anchorage inside the bay, and landing is easy at a natural rocky mole, at the mouth of a small river. This port lies directly under the western peak, and affords a fairly good anchorage with winds from N.E. to South. Approaching from the eastward the palms around the huts, Reddish Islet, Red Rocks, and a hut on the West point are good marks. Farther eastward is a red cliff with a cavern in it. The swell usually comes from the N.N.E.; bring the vessel broadside on with a kedge anchor to avoid the rollers. In the next bay, *Aakati*, there is no anchorage.

Vaieo, *Akaoto*, or *Bon Accueil Bay* of Marchand, is wide, but not deep, and lies to the South of the N.W. point. With the ordinary easterly winds it is perfectly sheltered, but, of course, untenable with westerly winds. There are several bays passing to the South, the last of which is Akatau or Hakatau (*Anse des Amis*, of Tessan), which is remarkable from a large sugar-loaf, whitened by birds, which rises from a reddish islet, *Obelisk Island* of Marchand. The anchorage is in the second bay, to the North of this. It may be known by the native houses and small chapel near a verdant valley. It is of very pleasant appearance. Its shores are covered with houses surrounded with cocoa-nut palms. The anchorage, very close to the land, in 18 fathoms, is well sheltered against the prevalent winds.

OUA-HOUKA, or Washington Island, as it was named by Ingraham, was called by Hergest *Riou Island*, and by Roberts *Massachusetts Island;* M. Tessan spells it *Houa-houna* (*Ua-Una*). It is also called *Roa-houga*. The population amounted to 260 in 1880. It is 7 miles in length E.N.E. and W.S.W., and has a very striking appearance; from East to West the land rises to a considerable height, and forms in the middle a pretty lofty mountain (2,430 ft.), steep toward the West. At a short distance to the westward is a double peak, which, as the eastern end is brought to bear N.W. by N., will disappear, and the high mountain in the middle will assume the form of a cupola, on the West side of which a column of a pyramidal form is conspicuous. On the South side there are two bights, in which an anchorage might be found, but they afford too little shelter for a ship to lie there in safety The West side of the island appears to be most fruitful. At the S.W. end is a rocky island, three-quarters of a mile in circumference, and between the two is a huge mass of stone, like a tombstone, named Hat Island. These two islands lie on the South

side of *Shavay Bay*, the coast line of which is indented with several coves. There is anchorage in 12 to 15 fathoms, 4 cables N. by E. of the islet off the West end of the outer island.

The West extremity of the island gradually descends to a steep and very prominent flattened rock, behind which there is said to be a secure harbour, which Krusenstern could not examine.

Invisible, *Vaipae*, or *Vaitake Bay*, lies about a mile north-eastward of Tekeo Point, the South point of Oua-Houka. The entrance to the bay is between two high black cliffs, and is very narrow, and the sea rough in it, so that only very small ships can come in safely, though there is ample depth for the largest (17 fathoms in the entrance). The interior is a beautiful sheltered basin, with a shelving beach, on which are established some English and Americans, a river entering the bay here, running through a valley from the N.E. These residents say that there is anchorage all round the island in 35 fathoms, at from half a mile to 2 miles off shore, and that there is good shelter, with easterly winds, to leeward of the islands, at the S.W. part of the island.

The principal anchorage is in *Hananai* or *Hannay Bay*, in the middle of the South side. It is known by a high sugar-loaf, or truncated cone, to the East of the centre of the bay, which cannot be mistaken on account of its blackish or rather violet colour. The anchorage is with this rock bearing East, and the West point of the bay N. 65° W., in 17 fathoms. The bay is uninhabited, but good fresh water may be procured at its head.

NUKA-HIVA is the principal island of the Marquesas Archipelago. By Ingraham it was called *Federal Island;* by Marchand, *Ile Baux;* by Lieut. Hergest, *Sir Henry Martin Island;* and by Roberts, *Adam's Island.* All these last must give way to the native name, which is variously spelt; *Nuka-Hiva* (Krusenstern), *Nou-ka-Hiva* (Du Petit Thouars), *Noukouhiva*, *Nou-Hiva*, or *Nuuhiva.*

It is 14 miles in length East and West, and 10 miles broad. It has been frequently visited and described, and its inhabitants are perhaps the best known of any in the archipelago. The details of their revolting cannibalism, their licentiousness, their treachery and apparent friendliness, will be read with great interest in the 9th chapter of Capt. Krusenstern's account of the voyage of the *Nadeshda* and *Neva*.

The number of people were estimated by Krusenstern, from imperfect data and observation, it is true, at 18,000. From the estimate of Roberts, a resident, but diminished one-third, they would be about 12,000, "a number undoubtedly very small for an island upwards of 60 miles in circumference, particularly as the climate is healthy, the use of the kava very moderate, and the venereal poison not yet introduced."

Notwithstanding the opinion of Krusenstern that his estimate for so large an island was low in 1804, it is reduced to 8,000 by the estimate of M. de Tessan

in 1838, and to 2,690 by Lieut. Jouan in 1856. Commander Mainwaring, who was here in 1873, in H.M.S. *Cameleon*, says:—"The native population of Nukuhiva in 1871 numbered 600 ! ! and is slowly decreasing. There were, in addition, 27 Europeans and 39 Chinamen, time-expired labourers who have settled on Nukuhiva, and married native women. The French resident, a naval officer, lives at Tai-o-hae, together with a few officials." In 1880 the population numbered 800, seeming to indicate that the decrease has ceased. The natives own a good many cattle.

The southern coast of Nuka-Hiva contains the principal places of resort and the best anchorages. Capt. Krusenstern thus describes it:—"The coast consists of lofty, rugged rocks, very steep towards the sea, and from which the most beautiful cascades of water are precipitated; among them, one at the southernmost end of the island is particularly remarkable, nor would it be easy to meet with anything more beautiful. The bed of this waterfall appeared to be several fathoms wide, and the water was precipitated from a rock, the height of which might be estimated at 2,000 ft. (2,165 ft. Jouan); this cascade was visited by Dr. Tilesius and Dr. Langsdorff, and forms the river which empties itself into Port Tschitschagoff. The chain of rocks is connected with the interior of the island; but to the north-westward of the southern point the coast is lower and flatter, and rises gradually toward the centre."

Vessels working to windward for Nuka-Hiva should never stand to the northward of the parallel of that island, or they will encounter calms and strong contrary currents.

On the South side there are three harbours where ships may lie in perfect safety, Comptroller Bay, Port Anna Maria, and Port Tai-oa or Tschitschagoff. Between Port Anna Maria and the latter there are several small bights or bays, that do not, however, afford an anchorage, being too little defended from the wind, and full of rocks.

Cape Martin, or *Tikapo*, is the S.E. point of Nuka-Hiva. Sir Edward Belcher approached it from the eastward; he says,—"At ten we saw the island of Nuka-Hiva through the haze. As seen from the eastward, it presents a long, low point on its north-eastern limit, and high abrupt heads; to the southward, that of St. Martin's, which forms the eastern head of Comptroller Bay, being very abrupt, and capped with masses of rock like ruined castles. I was much disappointed in the height of the mountains, which I had been led to expect were very lofty."

Taipi, or *Comptroller Bay*, as it was named by Hergest, is just to the West of Cape Martin. It is about $1\frac{3}{4}$ mile wide at its entrance, and is divided into three coves, which run in a N.N.W. direction. Vessels generally anchor in their entrances; outside the swell is heavy, and the depth great, 26 to 30 fathoms. *Hooumi* is the easternmost; in it the sea is usually calm, and landing easy on the sand. *Hangahaa*, the middle cove, runs in more than 2 miles to a sandy beach, where the depth is less. The best anchorage in it is a little to

the North of the bluff point, which separates it from the next creek, *Hakapaa*, or *Haka Puouae*. This latter is divided into two, in the N.E. of which a small vessel may anchor, but a large ship should not pass within the entrance points. All these anchorages are sometimes difficult to reach, from the breeze failing.

The following is a recent French account :—" Cape Martin, or Tikapo, which forms the East point of the bay, may be recognised by a rock, in the form of a tower, which surmounts it. This tower seems to incline towards the sea, when seen from the S.W. *Te-oho-te-kea Rock*, which is 600 yards to the South of the cape, may be taken for a boat under sail when it does not stand against the land.

" The winds in the interior of this bay blow in the same direction as those outside, but they incline to the S.E. at the opening of the coves of Haka-Haka and Haka-Punae. The currents near Te-oho-te-kea Rock and at the entrance of the bay are variable, and sometimes bear to the East, but generally they follow the direction of the trade winds.

" It is high water, on full and change, in Haku-Paa Cove, at $3^h\ 52^m$; springs rise 4¼ feet."

Tai-o-hae (*Taye-Hae*), **or Port Anna Maria,** is the next to the West. It was visited by Sir Edward Belcher, in H.M.S. *Sulphur*, and the following account is given of it :—" Suddenly a sandy beach opened behind an island, which presently discovered a deep, well sheltered bay, but rather narrow for working. Coming from the eastward, the port may be easily known by a very conspicuous, lofty basaltic dyke, which perpendicularly intersects the eastern outer bluff. Vessels intending to enter the bay should keep this bluff about a point on the starboard bow, rounding the island off it *within* a cable's length, when the wind generally leads in. All the eastern shores of the bay are bold-to, and free from danger, and the wind will always lead off.

" The view of the entrance of the bay is beautiful, far surpassing anything I have noticed in these seas ; and although rugged, isolated masses of rock here and there start up, to add their sombre effect to the otherwise brilliant tints of the landscape ; still the luxuriance of the slopes and valleys (and every inch where vegetation can thrive is stubbornly contested) produces a sensation which cannot justly be intrusted to pen or pencil."

Sir Edward Belcher fixed his observatory in a clear sandy bay to the eastward of the Pilot's Hill, which separates it from the town, the same spot occupied by Porter in 1814, and by the *Astrolabe* and *Zelée* afterwards. It is in lat. 8° 54′ 3″, long. 140° 6′ 40″ W., or, according to the French ship *Prevoyante*, in 1854, in long. 140° 0′ 12″.

It was the principal French settlement in the Archipelago, having been taken possession of in 1842, but it was abandoned as a French colony on January 1st, 1860. As being the only port in the group open to foreign shipping, a French resident is stationed here.

Commodore Powell, R.N., says :—Taiohai is a fine bay, and ships can lay at

single anchor on the eastern side in about 12 fathoms with perfect safety. Good water can be procured, although after the rains it is much discoloured. A wooden pier has been built on the East side of the bay, and affords good landing.

The French have reduced their establishment here to a resident, four soldiers, and a captain of the port, who also acts as pilot. The French authorities insist upon vessels taking the pilot, although he cannot possibly be of any service, as the only difficulties to contend with are baffling winds. The payment amounts to 200 francs going in, and the same sum going out, and this charge has effectually kept out whalers, that formerly were accustomed to frequent the bay. "The population of Tai-o-hae is rapidly diminishing, as may be noticed by the ruined huts in the adjoining valleys."—*Lieutenant Pailhès*, 1873.

Capt. Krusenstern thus describes the approaches to it:—"As soon as you obtain sight of Nuka-Hiva, coming from the eastward, you immediately perceive *Port Martin;* it has a very striking appearance, and cannot possibly be mistaken for any other inlet of this island. The land adjoining it forms the East extreme of Comptroller Bay; the point itself advances, and consists of steep, craggy rocks, that seem to have undergone some violent revolution, and a ship may approach within a mile of this headland, as well, indeed, as of the whole southern coast, without danger, as there is a depth of from 35 to 50 fathoms, over a fine sandy bottom. Shortly after a black rock appears in sight, about a quarter of a mile from Port Martin, which you leave on your right hand when Comptroller Bay opens upon you, lying North and South; and a little more to the westward is another smaller one.

"When Comptroller Bay is quite open, you steer parallel with the coast, the direction of which is E.N.E. and W.S.W. for 5 or 6 miles, until you perceive a small island called *Mattau* (or *Mataou*, or the *East Sentinel*), not more than 30 fathoms from the East point of the entrance. Upon opening this narrow passage, you steer straight for the island, and pass directly within about 100 or 150 fathoms of it, when Port Anna Maria lies immediately before you. On the West side of the entrance is another island of the same size as Mattau, and, like it, separated from the main land by a channel about 30 fathoms wide, and only navigable for canoes. This small island, the *West Sentinel*, called by the natives Mutonoe (*Motu-nui*, large island, a name given in derision for its small size), may be known by a rock that lies about 10 or 13 fathoms from it.

"The islands Mattau and Mutonoe form the entrance to Port Anna Maria, and care is necessary, both in entering and going out, not to approach too near to the westward island, or indeed to the westward shore, as an easterly wind, blowing even moderately, and a pretty strong current, render it dangerous. If there be a steady fresh breeze in the bay, the entrance is perfectly safe, and a vessel may near the coast on either side within 50 fathoms, or even still closer to the eastern side, nor is there anything whatever to render it the least dangerous; but with a moderate and unsteady wind, such as generally prevails in the bay, owing to the lofty mountains which surround it, no reliance must be

placed on these unsettled breezes, which veer in one moment from East to West, now coming in violent gusts, and immediately after falling perfectly calm. Under these circumstances, it is necessary to warp, which mode of getting in and out of the harbour, notwithstanding it is so laborious, and, on account of the burning heat, so fatiguing, is the only one to be depended on.

"About three-quarters of a mile from the northern shore the bay stretches itself in an East and West direction; you then approach to about a quarter of a mile of a very prominent hill on the East shore, where the least uncomfortable landing place will be found; and bring up in about 15 fathoms, mooring with your anchors in an East and West direction, and at the distance of half a mile from a small rivulet on the northern shore, where a supply of water may be procured. The East has a decided advantage over the other side, the currents not having the same effect upon the ship; and during our stay there of ten days, our cables were not once fouled, while the *Neva*, which lay on the West side, was obliged, almost every day, to clear her anchors."

It is easy to see if the wind blows into the bay, and if so vessels are advised to go on at once, and not wait for 9 o'clock, a.m., as some recommend.

It is high water, on full and change, at $3^h\ 50^m$; springs rise $4\frac{1}{4}$ ft.

To the West of Tai-o-hae is a small bay, *Haa-o-Tupa* or *Aotoupa*, the *Collet Bay* of the French. It is not safe. To the West of this again is another bay, uninhabited, called *Ua-Haka*.

Port Tschitschagoff, called by the natives *Hakaui*, or sometimes *Tai-oa*, lies $2\frac{1}{2}$ miles W.S.W. of Port Anna Maria, and was named by Capt. Krusenstern. At its head a projecting point divides it into two coves, *Hakaui* to the West, with about 3 fathoms water, and *Hakatea* to the East, with 6 to 8 fathoms. "At the entrance of the bay, the West side of which was formed by lofty and perpendicular rocks of a very wild and beautiful appearance, we found 20 fathoms water over a very fine bottom of sand and clay. As you advance on the East side there is another bay, apparently strewed with rocks, and quite exposed to the West, which occasions a very heavy surf. After passing the western point of this rocky bay, you open the finest basin that can be imagined; it lies in a N.E. and S.W. direction, is about 200 fathoms deep, and 100 wide; at the bottom of it is an even sandy beach, and behind this a green flat resembling a most beautiful bowling-green. Streams of water flowed in various places from the mountains, and in a very picturesque and inhabited vale. Some distance to the North of the entrance, called *Schegua* by the natives, is a considerable river. This side being exposed to the wind, landing here is more difficult, but it is probable that at high water a boat could enter this stream.

"The basin is so completely landlocked that the most violent storm would have scarcely any effect on the water, and a ship in need of repairs could not wish for a finer harbour for such a purpose. The depth for such is exceedingly convenient. Bananas, cocoa-nuts, and bread-fruit are superabundant, but animal provisions are scarce. The chief advantage of it is that you can anchor

about 100 fathoms from the land, thus having the king's house and all the village under the guns of the ship, in case of an attack. Its chief fault is the narrow entrance, which in one part is only 120 fathoms wide, but is deep, so that you might easily warp out if the wind is moderate."

The western or leeward coast of the island is called the *Henua-Ataha*, or desert land. Instead of being steep and abrupt, it slopes gradually up to the mountains. The natives come here to fish, but there is no harbour. It will be prudent to avoid this coast on account of the calms caused by the high lands, and which extend for 2 or 3 miles off shore.

The East coast of the island runs northward from Cape Martin to *Atoupa-atoua*, or *Cape Adam and Eve*, a distance of 8½ miles, and for one-third of the distance is a perpendicular wall. To the southward of the latter cape is *Hatuata*, or *Aa-toua-toua*, and *Neva Bays*, open and exposed to the trade winds, and surrounded by high mountains, 3,000 to 3,600 ft. high. Cape Adam and Eve, or *Mataua*, consists of three parts, projecting to the N.E. from a peninsula. On its N.E. extremity, and at two-thirds of its height, are two singular rocks, which, seen in some positions, look like grotesque statues of a man and woman, hence its name. By the English and Americans they are called *Jack and Jane*. The current runs very rapidly around it.

The North coast runs generally East and West for 13 or 14 miles, and is more broken than the South coast, and intersected by several bays, some of which are very deep; but in the season of the N.E. winds, which veer to the North, they raise a very heavy sea in them.

Hataïvea, a narrow gullet only fit for boats, runs in just to the westward of Cape Adam and Eve. Off its West entrance point is Motu-iti, a pointed rock, which also marks the entrance to *Anaho*, the next bay, which is 1½ mile deep. This was formerly used by the whalers; it was sometimes difficult to leave, but the anchorage and shelter are tolerable, in 10 to 15 fathoms, at 3 to 5 cables from its head. The head of this bay is close to that of Hatuata on the East coast, being separated only by a narrow isthmus. About a mile from Anaho is the next bay to the West, *Hatiheu*, or *Atte-haya*. This last is the third from the N.E. cape, and is known by a cliff of brown rocks, on the summit of which is a small peak which cannot be mistaken. At the head of the bay is (or was) the white house of the Roman Catholic missionary. The best anchorage is two-thirds up the bay, but precaution should be used, as it is difficult to beat out against the northerly wind. *Hahume* is the next bay to the West, a slight indentation without inhabitants. *Hakapa*, the next, is about 8 miles West of Cape Adam and Eve. It is open to the North, and surrounded by rugged basaltic rocks. Beyond this the desert country commences, and the only bay deserving of notice is *Hakaehu*, formerly much used by the whalers, who anchored in the offing. At its head is a fine sandy beach, through which

two rivulets run. The highest peaks of Nukahiva are close in the rear of Hakaehu, rising to the height of 3,840 ft.

Motu-iti, Hergest Islet, or the *Two Brothers*, 25 miles W. by N. from the N.W. point of Nuka-hiva, is a high volcanic rock, elevated 130 ft. above the sea. About a mile to the East there are two other white islets entirely deprived of vegetation, and much lower than Hergest Islet; they ought not to be approached too closely. Ingraham called them *Franklin Island*, and Roberts *Blake Island*, mistaking them for a single island. There is abundance of fish around them, and large flocks of gulls, who have left a considerable deposit of guano, but of bad quality.

Shoals are reported to lie from 6 to 15 miles between W. ½ N. and W.S.W. from Hergest Rocks. *Lawson Shoal* is reported by Captain Turner to lie approximately 10 miles W. by S. ½ S. from Hergest Rocks, and to have 4 to 10 fathoms over it.

Clark Bank could not be found by Admiral Du Petit Thouars in the assigned position, lat. 8° 18′, long. 139° 50′. He sounded to 200 fathoms. It has been seen by several ships, among others, Capt. Turner, of the whaler *Spartan*, crossed it in April, 1855. He found 8½ fathoms, and from the mast-head there were spots seen which had less than 16 ft., so that it requires the utmost caution. Capt. Turner, of the brig *Nautilus*, in December, 1869, sailed 3 miles over this bank from North to South, piloting his vessel through the deepest parts. Its South end he places in lat. 8° 8′ S., long. 139° 53′ W. It is not shown on the French survey of 1875, having been searched for unsuccessfully.

A Coral Island exists E. by N. ¼ N. about 9 miles from Hatoutou or Chanal Island. It is in reality on a bank of coral and sand, raised 6 or 10 ft. above the water, on which the sea breaks high. The shoal on which it stands stretches a long way to the West under water. Soundings on it were got from 6 to 55 fathoms. As the edges of this shoal are very abrupt, much care is required, and besides this there are vague reports from the whalers of other coral reefs hereabout, but nothing precise.

The natives assert that there is a *shoal* quite visible in the direction of the Hergest Isles from Hakaehu, on the North side of Nukahiva; and also that midway between Cape Martin and Uahuga there is a *shoal* with 26 fathoms water. These reports require confirmation, though deserving of attention.—*Lieut. Jouan.*

HIAU, or E-Iao, was named by Lieut. Hergest *Roberts Island;* by Marchand, *Masse Island;* by Roberts, *Freemantle Island;* and by Ingraham, *Knox Island.* It is much larger than the adjoining island, *Hatoutou*, and like it is very high, 2,000 ft. according to M. Tessan. It is more varied in its conformation, and is 6½ miles in length N.E. and S.W.

Lieut. Hergest says its shores are rocky, without any coves or landing places; and though its surface was green, it produced no trees, yet a few shrubs and bushes were thinly scattered over the face of the rocks; nor did it seem to be

otherwise inhabited than by the tropical oceanic birds. These were in great numbers about it, and it seemed to be a place of their general resort. The N.W. side, however, had a more favourable aspect, and although its shores were also rocky, a number of trees were produced, as well on the sides of the hills as in the valleys. This side afforded some coves, where there is good landing, particularly in one near the middle; this, from the appearance of its northern side, was called *Battery Cove*. A little more to the North of this cove is a bay (*Cocoa-nut Bay*), which Lieut. Hergest and Mr. Gooch examined; good anchorage and regular soundings were found, from 18 to 5 fathoms; the bottom a fine clear sand. An excellent run of fresh water discharged itself into the bay, near a grove of cocoa-nut trees; here they landed, and found a place for entering, &c. The landing was but indifferent, on account of the surf; but water is easily obtained.

In the two valleys above alluded to, the vegetation seemed more rich and active than in any other parts of the island. Besides these, between the peaks several plateaux covered with pine trees and verdure were seen. Notwithstanding its beauty and fertility, it is (or was) not inhabited. Without doubt there is water to be got in the entrance, and cattle are abundant.

Hatoutou, Fattu-uhu, or *Fetou-houhou*, is called *Chanal Island* by Marchand; by Ingraham, *Hancock Island;* and by Roberts, *Langdon Island.* It is very much smaller than Hiau, being about 3 miles in length, and not more than 1 mile in breadth. It is covered with a vegetation which cannot be compared to that of Dominica; but it is incorrect to call it barren. At the North point of this island there is a large high islet, at a short distance from the shore. The South point of Hiau is low; some detached and low rocks show themselves, which seemed to those on board *La Venus* to extend some distance beyond the visible rocks.

Midway in the channel separating Hiau from Fattu-uhu some thought they saw a breaker, but this fact was not absolutely established; in the consequent doubt it would not be prudent to attempt the passage.

These two islands are probably the *New York* and *Nexsen Islands* of Captain Fanning, 1798. They have an abundance of fish and sea-fowl, which the natives of Nuka-hiva and Roapoa come from time to time to enjoy. These islands are thus like what Teturoa is to Tahiti, a place of resort for the licentious tribes, who come hither to give themselves up to gluttony and debauchery.

DETACHED ISLANDS AND SHOALS BETWEEN THE EQUATOR AND LATITUDE 10° S.

Following the previous plan. in this belt of latitude we commence to the westward of the Marquesas Islands. The space comprised within these latitudes, and between the Galapagos Islands and those last named, has not a single point of land or shoal hitherto discovered.

CAROLINE or Thornton Island.—In 1795 Capt. Broughton saw an island in lat. 9° 57′ S., long. 150° 25′ W. He passed it at the distance of 6 miles; and as it is very low, he might readily be mistaken as to its actual size. He named this *Caroline Island*. Lieut. Chauvinière, of the French transport *Somme* (1870), describes it as low and similar to other lagoon islands of the Paumotu Group.

According to the United States survey of 1882, it is about 6 miles long, North and South, varying from about 3 cables wide at the North end, to a little over a mile wide at the southern part; it is well covered with cocoa-nut and other trees, which render it visible at the distance of 16 to 20 miles. It consists of many islets of various sizes, with guano on them, encircling a lagoon, the entrance to which is capable of admitting vessels of about 30 tons. The reef on the windward side breaks, except at the N.E. point, to the distance of a mile. From the S.E. and S.W. points of the island this reef sends out two bifurcating branches to the distance of about 3 cables (the French officer states 1½ mile)—one towards the S.E., the other towards the S.W.—and is consequently dangerous to approach at night. The reef is close to the islets on the West side, and no breakers were seen off the N.W. point. There is no anchorage; but a landing (not always safe) may be effected on the North side of the S.W. bifurcation described above, and near the spot where the English flag is hoisted on a mast; the mast bearing S.E. by E. ½ E. leads to the boat entrance through the reef.

It is high water, on full and change, at 4^{h}; springs rise 1½ ft. The officers of the U.S.S. *Hartford* made the observation spot near the flagstaff to be in lat. 10° 0′ 1″ S., long. 150° 14′ 30″ W.

It was taken possession of by Capt. Nares, H.M.S. *Reindeer*, 1868, for the English, and its position was given as lat. 9° 54′ S., long. 150° 8′ W. On the southern island is a settlement; the chief occupation of the settlers, who numbered 27 in 1868, was raising stock, pigs, and poultry, and collecting fish for salting; also the planting of cocoa-nut trees for the purpose of producing cocoa-nut oil. Guano also is exported. Water may be obtained by digging. There is no anchorage off the island, but a mooring buoy is placed in 90 fathoms about 120 yards from the edge of the reef.

Vostock Island and *Flint Island* have been before described on page 648.

MALDEN ISLAND, discovered by Lord Byron in H.M.S. *Blonde*, in 1825, has on it several clumps of thick fresh-looking trees, so compact that at a distance they were taken for rocks; these clumps are useful when approaching the land, for in no place is it higher than 30 ft., and scarcely visible at 7 miles off. Landing was easy, but shoals of bold sharks rendered it rather dangerous. No inhabitants were found on it by the *Blonde*, but traces of former people were seen—large square areas, raised 3 ft. above the ordinary surface, supported by blocks of wrought coral, and each having in the centre what may be taken for an altar or tomb, similar to those mentioned on the isolated Easter Island before described. It was named after the surveying officer of the *Blonde*, Lieutenant Malden. It has more lately been announced (1860) as *Independence Island*. It is a British possession, and had a population of 79 in 1876.

Lieut. Chauvinière, of the French navy (1870), says:—"The reefs off the N.E. and S.E. ends *appear*, when viewed from a distance, to stretch seaward from 1 to 2 miles, but such is not the case; being the windward side, the sea breaks farther out than to leeward; still the N.E. is the most dangerous point. Landing on the East side is rarely possible, owing to the heavy sea.

"The West side is quite safe, and the reefs off the N.W. and S.W. ends only extend to the distance of a few cables. The Guano Company have laid down moorings and buoys, and run out stages as far as possible, so as to give every facility in the loading of guano. We moored 100 yards from the shore, the depth there being upwards of 70 fathoms, bottom of white coral. There is no fresh water; no cocoa-nuts; and but a scanty vegetation.

"When the sun is North of the Line, during the period of East and E.S.E. winds, when the heave of the sea is from S.E., the northern side of the island is practicable, as well as the S.W. side; when the sun is South of the Line, during the period of the true N.E. trade, with the heave of the sea from N.W., the South side is practicable.

"The loading of guano is carried on at all times, except during a few days at full and change of the moon. The tide rises 1½ ft."

Vessels coming here for guano should make the South side of the island, and a pilot will come off and take the vessel to her moorings. Vessels of 300 to 400 tons can anchor, but larger vessels must secure to the mooring buoys. No supplies can be obtained here, and ships are expected to leave a supply of water, or coal for the condenser.

Lieut. Thomas, H.M.S. *Falcon*, gives the anchorage as in lat. 4° 5′ S., long. 154° 56′ W. Lieut. Chauvinière makes the flagstaff on the West side in lat. 4° 1′ S., long. 154° 57′ W.

STARBUCK ISLAND was also discovered by Lord Byron, in 1825. It is most likely identical with *Volunteer Island*, discovered, in 1823, by the *Eagle*, an English whaler. It has been very vaguely placed on the charts, and to this cause probably is owing the many wrecks which have taken place on it. The

island was taken possession of for the British by Comm. Swinburne, of H.M.S. *Mutine*, in December, 1866. There is no anchorage, and landing is difficult.

Lieut. Chauvinière (1870) describes it as low (15 ft.), similar to Malden Island, except the trees, and not visible at a greater distance than 7 miles, even under favourable circumstances. It is 5 miles long, East and West, 1½ mile wide, and surrounded by a narrow, steep reef for the distance of nearly half a mile from the shore, except off the East side, where it extends farther. The North and N.W. sides are the only practicable parts for landing. It had been visited for guano, then abandoned, but subsequently revisited by the company working Malden Island. Near the N.W. point, quite close to the shore, the depth is 15 fathoms, and 85 yards farther out the descent is from 15 to 130 fathoms and upwards; off the N.W. side the depth is 60 fathoms close to the shore, and deeper still off the North side: anchorage off the South side is wholly impracticable. Landing is dangerous on any part, and should only be attempted off the West and N.W. points, where there is a passage through the reefs. There are wells of brackish water on the island. Two mooring buoys were placed off the West end.

Position, by H.M.S. *Falcon*, 1867, lat. 5° 36½′ S., long. 155° 51′ W.; by the French transport *Euryale* (which was wrecked there in 1870), lat. 5° 37′ S., long. 155° 56′ W.; by Lieutenant Chauvinière (flagstaff on the West side), lat. 5° 38′ S., long. 155° 55′ W.

Lieut. Chauvinière considers "that the approach to these low islands (Malden and Starbuck), especially from the eastward, must be made with great caution, owing to much of the shore being awash, and to the prolongation of the reefs in that direction. The current also is very strong; between Malden and Starbuck it ran to the westward 32 miles in 24 hours; and in the vicinity of the latter island it has been estimated to run 43, 51, and even 56 miles to the W.S.W. in 24 hours. In March, 1870, when the *Euryale* was lost on Starbuck, the current set 50 miles W. by N. ½ N. in 24 hours." Sailing vessels wishing to call at these islands must therefore use some caution not to get to leeward of them, as it is a very tedious proceeding to beat back.

TONGAREWA or PENRHYN ISLAND.—This island is supposed to have been seen from a distance by the ship *Penrhyn*, in 1788, hence the name: it may be the *Bennet Island* mentioned by Krusenstern; nor is it unlikely to be the *Peregrino* of Quiros, and the *Pescado* of Torres and Torquemada. On April 30th, 1816, it was seen by Kotzebue, who spent more than a day in its vicinity: viewed, he says, from a distance of 3 miles it appeared to be a group of islands, connected by coral reefs, and formed a circle with a lake in the middle, from which many rocks arose; the islands were covered with a thick wood of cocoa-nut trees. The natives, though bold, were not found to be as savage as described in 1841 by Wilkes. The native name is Tongarewa.

In the narrative of the United States' Exploring Expedition, it is stated that

the island was by estimate 50 ft. high, and was found to be 9 miles long N.N.E. and S.S.W., and about 5 miles wide, with an extensive lagoon, having in it many coral patches. There is a boat entrance into it. On the N.W. side there appears to be a continuous village, with cocoa-nut groves throughout its whole extent, and the island is evidently very thickly peopled. The ferocity of the savages precluded the possibility of attempting a landing.

From the remark-book of H.M.S. *Falcon*, 1867, Penrhyn Island consists of numerous low islets, connected by reefs, surrounding a lagoon, the whole of an oval form, about 9 miles long and 5 miles broad. All the islets are covered with cocoa-nut palms, many however without heads—an indication that a hurricane had swept over the island. On the N.E. side, near the northern extreme, is a clear opening into the lagoon, in which the least water found was 2 fathoms. Mother-of-pearl shell is found here.

Wilkes makes the N.N.W. point in lat. 8° 55¼′ S., long. 158° 7′ W., and the South end, lat. 9° 6½′ S., long. 158° 2′ W.; Kotzebue's latitude agrees with this, but his longitude was 29′ more to the eastward. According to the latest observations the South end is in lat. 8° 58′ S., long. 158° 6′ W.

JARVIS ISLAND is a small coral island, triangular in shape, 1¾ mile long East and West, and a mile North and South. It exhibits the appearance of a white sandy beach, 10 or 12 ft. above the sea, without a tree or shrub, and but a few patches of grass. A few sea birds were seen about it, and it was considered very dangerous. Lat. 0° 22′ 33″ S., long. 159° 54′ 11″ West.—*Wilkes.* It has been occupied by the Phœnix Guano Company, who placed men on it for the purpose of working the guano beds.

Mr. J. D. Hague, who reported on the guano islands in 1862, says, that like Baker and Howland, guano islands to the westward, it has the general features of a coral island, but it differs from them essentially in the fact that it once contained a lagoon which has gradually been filled up with sand and detritus, while the whole island has undergone some elevation. The flat depressed surface in the centre of the island is about 7 or 8 ft. above the level of the sea.*

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* Several islands and reefs have been announced as existing in this neighbourhood, probably all referring to Jarvis Island. None of them were seen by the United States' Exploring Expedition. The first was discovered by Capt. Brown, of the English ship *Eliza Francis*, August 21, 1821; it was said to be a small island, 5 miles in circumference, covered with bushes, in lat. 0° 23′ S., long. 159° 46′ W.

Bunker Island, an American discovery, is also most likely identical with these: it is small. In this case another island, called *Brocke Island* by the Americans, must exist a short distance from Bunker or Jarvis Island, in lat. 1° 13′ S., long. 159° 30′ W., or, corrected from Wilkes's position, 159° 40′ W.

Victoria Island, another doubtful island, is placed on the chart in lat. 6° 45′ S., long. 160° 40′ W.

THE TOKOLAU, OR UNION GROUP.

From information obtained by the Rev. S. J. Whitmee, in 1870, and that derived from Wilkes's Narrative of the United States' Exploring Expedition, we chiefly gain the following information.

The group consists of three clusters of islets, the islets of each cluster being connected by a reef, thus forming one of the numerous atolls to be found in the Pacific. These reefs are more or less circular in form, enclosing a lagoon in the centre. The land is formed on the raised reef by the washing of sand and broken coral from the sea during rough weather. In some of the older atolls the land is connected and forms a continuous ring around the lagoon; but more commonly land exists only here and there along the reef, thus forming a ring of islands, some from 1 to 6 miles in length, covered with cocoa-nut palms and other trees, and some only a few yards across, upon which two or three stunted cocoa-nuts barely manage to exist; while others again are mere sand-banks destitute of all vegetable life.

FAKAAFO, or *Bowditch Island*, was discovered by Capt. F. Morvan, of the *l'Adolphe*, of Morlaix, and was seen by the U.S. discovery ship *Peacock*, on January 28, 1840. It is of coral formation, and its shape is that of a triangle, with the apex to the South. From North to South it is 8 miles long, and in width from its West point 4 miles. On its S.W. and North points it is of considerable elevation, and the most elevated parts are connected by a coral reef, which is awash. On the East side the land is more continuous, and on these parts there are extensive groves of cocoa-nut trees and a shrubbery. There is no entrance for a vessel to the lagoon, which, from the appearance of the water, has but little depth. The party landed on an islet in the S.W. part, which the natives called *Fakaafo;* it was covered with cocoa-nut trees, but had no houses on it. The town is opposite the islet, and here water was procured from a carefully-kept well. The natives appeared unacquainted with Europeans and with the use of fire. The North extreme is in lat. 9° 22′ S., long. 171° 10′ W. (approx.).*

The Rev. S. J. Whitmee, 1870, says:—All the islands are very barren, yielding little except cocoa-nut palms and a species of edible pandanus. Upon these and fish, which are plentiful, the people entirely subsist. . . . Only one of the islands is inhabited. The population is only 223 at the present time, and more than two-thirds of the adults are females. Roman Catholicism divides the field with Protestantism.

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* *Stuart Reef* was reported by Capt. Stuart, of the ship *Corinthian*, to be 15 miles long, E. by S. and W. by N., and 3 miles broad, with a small part above water; lat. 8° 55′ S., long. 170° 15′ W. Its existence in the position assigned was disproved by the U.S.S. *Narragansett*, in 1872.

In 1880, Capt. Maclear, of H.M.S *Alert*, called here and ascertained that the population were 80 in number, all professing Christianity.

NUKUNONO, or *Duke of Clarence Island*, was discovered by Capt. Edwards, of the *Pandora* frigate, in 1791. It was surveyed by the American Expedition, and found to be 7¼ miles in length in a North and South direction, and 5 miles wide East and West. It is of a triangular form, with the apex to the North. It has a lagoon similar to that of Duke of York Island, with islets in it; the N.W. side is a bare reef awash, on which the sea breaks heavily. Many cocoa-nut and other trees on it. It is more populous than Atafu, and the inhabitants are Roman Catholics. In 1880, there was a village and a church on the western islet. Its North point is in lat. 9° 5′ S., long. 171° 46′ W. (approx.).

ATAFU, *Oatafu*, or *Duke of York Island*, was discovered by Commodore Byron, in 1765, who, however, does not give the position in his narrative. He said it was uninhabited. Wilkes surveyed it in 1840. It is a lagoon island of coral formation, 3 miles long East and West, and 2½ miles wide North and South. There is no passage into the lagoon; the sea breaks on the reef with violence, but at high water a boat may pass over without difficulty, if proper care is taken. The islets that have been formed on the reef are 8 or 10 ft. above the water, and are covered with cocoa-nut and pandanus trees. They have no water; the supply is wholly obtained from excavations made in the body of the cocoa-nut trees.

"This atoll is of similar formation to Fakaafo; but the lagoon is smaller. The islands studding the annular reef are about twenty in number, and consist of sand and broken coral, washed up by the action of the waves without the slightest trace of soil. Here I had a peep into the secret of island formation. As I was walking on one side of the island on which the village is situated, I noticed a series of sandy mounds running parallel with the coast, and varying from 10 to 50 ft. in breadth. Some had cocoa-nut palms and pandanus growing on them, and producing fruit; on others the vegetation was of more recent growth; while others were bare, or with only a few of the pandanus fruit, which had by some accident been cast upon them, sprouting and giving promise for the future. The outer mound was fully 50 ft. across, and had been washed up during heavy weather at the beginning of the present year. The population of the island is 136, it having been greatly diminished by the Peruvian slavers .All are nominally Christians."—*Rev. S. J. Whitmee.*

The town on the northern side of this island was communicated with, and it was found that one European resided here, being employed by a New Zealand firm to collect copra, for which a schooner occasionally called. From him it was gathered that there were on the island 250 natives, all professing Christianity; here, also, a church had been built.—*Capt. Maclear*, 1880.

A reef awash is reported to have been seen off the N.W. end of Oatafu, and

appearances of foul ground extending from the West and S.W. sides of the island, for 2 or 3 miles. The reef awash, extended about 3 miles E.N.E. and W.S.W., curving towards the S.W. extremity, from which the western end of Oatafu bore S.E. by S., distant about 3 miles.—*Mr. Ghent*, P.M.S. *Zelandia*, 1877.

Oatafu and Nukunono are said to be placed 10 miles too far East upon the Admiralty Chart.

PHŒNIX GROUP.

This appellation is applied to a scattered number of islands, from the name of one of its members, by the United States' Exploring Expedition. These islands have since been visited for guano, of which the supply is now nearly exhausted. Deposits were found on Mackean, Phœnix, and Enderbury Islands. There are eight islands in the group.

Winds.—Captain Elias Hempstead, the guano company's superintendent, states that during three years on Enderbury Island the wind blew steadily from E.N.E. to E.S.E. three-quarters of the time, the other quarter from N.E. to S.E., and he had never seen the wind from the westward. Very little rain falls on the island, although it rains heavily in the immediate vicinity.

MARY ISLAND.—This island has been called *Mary*, *Swallow*, *Canton*, and *Mary-Balcout Island*, and assigned various positions. Commander Meade, however, of the U.S.S. *Narragansett*, finally fixed the position of its North end as in lat. 2° 44′ 35″ S., long. 171° 42′ W. The discrepancies may be accounted for by the strong currents prevailing in the vicinity, and the doubtful navigation of a great proportion of whaling ships from which the majority of these reports are received.

Mary Island is of coral formation, from 10 to 18 ft. above the sea, about 11 miles long, S.E. by E. and N.W. by W., and of triangular form. The width of the island varies from 50 to 500 ft., inclosing a spacious lagoon. Two openings were seen on the West end, one dry at low water, the other having apparently about 8 to 12 ft. water. Openings were also seen about midway between the S.W. and Pyramid Points, and on the N.E. side near the latter point.

The surf was breaking very heavily on the North point, and on Pyramid Point heavy tide-rips extended at least half a mile from the weather side of the island. A strong westerly current was sweeping past the land, running at least 1½ mile per hour.

ENDERBURY ISLAND is placed by Wilkes in lat. 3° 8′ S., long. 171° 8′ 30` W., but by Lieut. Hemphill, of the U.S.S. *Tuscarora*, it is placed in lat. 3° 8′ 42″ S., long. 171° 3′ 32″ W. It is of peculiar appearance for a coral island. Its South end, almost bare of vegetation, is the widest, and on it are two clumps of stunted shrubs and plants. The greatest height of the

island above the shore reef is about 23 ft., and is consequently difficult to distinguish at night.

"Enderbury Island, lying nearly North and South, is about 3 miles in length and 2½ miles in breadth. On the West side, at nearly 1 mile distant from the N.W. point, is the landing place, off which are the mooring buoys. As there is neither wood nor water upon the island, ships visiting it for guano are required to land a certain quantity of each. The water used on the island is brought from Honolulu.

"With winds to the northward of East, vessels should approach the anchorage, round the North end of the island, and with the wind southward of East, round the South end. When the wind and current permit, a boat will meet the ship off the N.E. or S.E. points of the island, and vessels must be prepared for securing to a buoy. After passing the N.W. or S.W. points, steer along shore at a distance of about 1 cable from the high-water line."—*M. Lachwitz*, 1874.

It is high water, on full and change, at about 5^h; springs rise 6 ft., neaps 3 to 4 ft. There are two tides per day. A westerly current sets past the island at the rate of about 1 mile per hour, and seldom exceeds 2½ miles an hour during springs. Vessels making the island at night must make allowance for this set.

The following information is taken from the report of Captain Schorf, published in "Annalen der Hydrographie," Heft I., 1878 :—

Enderbury Island is a mile in width, and is surrounded by a fringing reef of coral, which is steep-to, extending from half a cable to a cable off shore. Two small mangrove thickets and scattered patches of grass form the only vegetation. There is no anchorage, but a large wooden buoy is moored on the western side, close to the fringing shore reef, in about 75 fathoms, for the convenience of vessels loading with guano, which can be done during easterly winds; it is, however, also necessary to secure by hawser to an anchor imbedded in the shore. A pier has been built out from the western side of the island, where boats load the guano, which is brought down on trucks drawn by mules, from the main works, about 2 miles distant. A schooner, belonging to the company working the guano, calls every three months from Honolulu.

The winds prevail almost constantly from the eastward, but squalls accompanied by light rain occur all the year round in the neighbourhood; very little rain falls on the island. The wind is variable from January to May, during which period bad weather is most common.

PHŒNIX ISLAND is about 1 mile long and half a mile wide, and 18 to 20 feet high, running W. by N. and E. by S. The position of the centre is lat. 3° 47′ S., long. 170° 43′ W.

The buildings, flagstaff, and wharf of the Phœnix Guano Company are still standing, but the island has been worked out, and was abandoned in August,

1871. Except a little grass here and there, no vegetation was seen on the island.—*Commander Meade*, 1872.

BIRNEY ISLAND was discovered by Captain Emment, who also discovered Sydney Island. According to Captain Wilkes, it is in latitude 3° 34′ 15″ S., and long. 171° 33′ W., but later observations place it in about lat. 3° 37′ and long. 171° 42′. It is only a coral island, 6 ft. above the sea, about 1 mile long, N.W. and S.E., and a quarter of a mile wide. It is but a strip of coral, apparently uplifted, and is exceedingly dangerous for vessels.

Winslow Reef was discovered about 1851, in the ship *Phœnix*. Captain Winslow says that it extends N.W. and S.E. about a mile, and is three-quarters of a mile broad, with two pointed rocks awash; soundings were obtained from a boat. Lat. 1° 40′ S., long. 174° 50′ W. *Windsor Reef*, reported in lat. 2° 0′ S., long. 175° 40′ W., is probably the same.

GARDNER or Kemin's Island, placed by Krusenstern among the doubtful islands, was fixed by Wilkes's Expedition as in lat. 4° 37′ 42″ S., long. 174° 40′ 18″ W. It is a low coral island, with a shallow lagoon. Birds were numerous and very tame. A large rat was found (perhaps indicative of water). The trees on it were 40 ft. high, but no underwood; visible 15 miles. The flood sets strong to the northward; the rise and fall of tide being 4½ ft.

M'KEAN ISLAND was discovered by Wilkes, in lat. 3° 35′ 10″ S., and long. 174° 17′ 26″ W. It is of coral and sand blocks, 15 ft. high; with no trees or bushes. It is three-fourths of a mile long, by half a mile broad.

HULL ISLAND, the N.W. point of which is in lat. 4° 29′ 48″ S., long. 172° 20′ 52″ W., was discovered by Wilkes, August 26, 1840. It is a lagoon island, and has a little fresh water, and a few cocoa-nut trees upon it. They were surprised at finding eleven Tahitians with a Frenchman on it, catching turtle, of which they had taken seventy-eight in five months; it offers, therefore, few inducements to visit.

SYDNEY ISLAND was discovered by Capt. Emment, who also discovered Birney Island. It was placed in its present position on the charts by Capt. Wilkes, from information supplied him by the natives of Hull Island, who also described it as similar in character to Hull Island. A great doubt existed as to whether Sydney Island occupied the position assigned, or whether it was the same as Hull Island. Lat. 4° 25′ S., long. 171° 20′ W. (approx.). It is of coral formation, a belt of wood surrounding a shallow lagoon not open to the sea; it is about 20 ft. high, and 2 miles long by 1 mile broad.

BAKER ISLAND and **HOWLAND ISLAND** are described in the North Pacific Directory. Baker Island is of coral formation, 20 feet high, with patches of grass here and there. The American Guano Company's wharves, &c., are on the West side of the island, but the deposit was nearly worked out in 1872. Commander Meade makes its position lat. 0° 13′ 30″ N., long. 176° 29′ 30″ W., for the centre of the island, which is about a mile in diameter.

No loading takes place between November and April, as westerly winds frequently occur.

Howland Island is 1½ mile long N.N.W. and S.S.E., and half a mile wide. It is 20 ft. high, with a few clumps of vegetation. The guano is shipped from the western side of the island. Position of centre, according to Commander Meade, lat. 0° 49′ N., long. 176° 40′ W. The latest charts place it in lat. 0° 39′ N.

ELLICE GROUP.

This group of islands extends N.W. by N. and S.E. by S. 360 miles, and consists of nine atolls or clusters of islands, eight of which are inhabited. Five of the islands are well known to the missionaries, and the rest are visited by them occasionally. They lie between lat. 5½° and 11⅓° S., and between long. 176° and 180° E.

The officers of H.M.S. *Basilisk* remark—"It is to be noted that, when hove-to off the islands in the Ellice Group, there was always so strong an *equatorial current setting to the West*, that it was with great difficulty the ship could be kept near the land. With the exception of Speiden or Lynx Island, we found the position of the Ellice and Mitchell Islands tolerably correct. They are all low and flat, the tops of the cocoa-nut trees being from 60 to 80 feet above the water."

Natives.—As a race the Ellice Islanders are very quiet and peaceable. Quarrels are rare, and ordinary disputes are settled by the authority of the king or chiefs. On some of the islands wars are unknown. An old man on Vaitupu brought me a hatchet made out of the back of a turtle, and I asked if it had ever been used in war. He replied that he had never heard of war at Vaitupu. In every respect, the people in this group compare very favourably with the inhabitants of other groups with which I am acquainted. They are much like the Samoans and Tongans—perhaps more like the latter than the former. —*Rev. S. J. Whitmee*, 1870.

The information respecting the group is chiefly derived from Capt. Wilkes's Narrative of the United States' Exploring Expedition; from the Rev. S. J. Whitmee's Report of the visit of the missionary barque *John Williams*, in 1870; and from the visit of H.M.S. *Basilisk* in 1872.

SOPHIA ISLAND.—This is probably the *Mattinson*, *Independence*, and *Rocky Island* of whalers and others. It has been described as a small wooded island, 2 to 3 miles in circumference, and sufficiently high to be seen at the distance of 18 to 20 miles. A bank has been reported to lie 4 miles N.E. of it, on which the depth may be from 15 to 12 fathoms, or less. It is supposed to be uninhabited. Captain Challis, H.M.S. *Rosario*, in 1870, made Sophia Island in lat. 10° 46′ S., long. 179° 31′ E.

Meek Shoal, a coral reef seen by Mr. John Meek, of the ship *Sir James*

Cockburn, 1832, lies to the West of the last position. No breakers. Latitude 10° 40′ S., long. 179° 8′ E. It is doubtful if it exists in this position.

Rose Bank.—The master of the cutter *Rose* reports having passed over a large coral bank upon which depths of 14 and 15 fathoms were obtained, lying about 25 miles S.E. by S. from Sophia Island, or approximately in lat. 11° 3′ S., long. 179° 50′ E.; the bottom was plainly seen, and appeared to be irregular; no land was in sight from the mast-head.

NUKULAELAE, or Mitchell Group of the whalers, was seen by Capt. Boissier of the *Nicholas César*, who, passing a short distance North of it, described it as covered with cocoa-nut trees, and visible 10 miles off.

The Rev. S. J. Whitmee says that this atoll consists of "several small islands encircling the lagoon, on one of the largest of which is the village. The population is very small, only 90 at the present time, as this is the place where the Peruvian slavers made the greatest havoc in 1863, kidnapping three-quarters of the population, who have never since been heard of.

During the visit of H.M.S. *Basilisk* (1872), the group was found to be "a cluster of eleven or twelve islets, situated on a coral reef which surrounds a shoal lagoon, extending about 5 miles North and South, and 2 miles East and West. A shore reef attaches itself to all the islands, which renders the landing for boats a hazardous operation; even the native canoes are frequently capsized. There is no passage into the lagoon for ships, but a precarious anchorage may be obtained off the reef, on the lee side, in fine weather. The principal village and the best landing-place is on the W.S.W. side of the cluster, and may be known by a neat whitewashed church, which, when abreast of the islet on which it is built, may be seen through the trees. Canoes come off readily to the ship. A small quantity of brackish water may be obtained. The natives, about 70 in number, are all cleanly and inoffensive. A white man is resident on the island."

Position.—By Capt. Boissier, lat. 9° 27′ S., long. 179° 54′ E.; by the missionaries, lat. 9° 18′ S., long. 179° 48′ E.; the part not stated in either case. The latter position is probably nearly correct.

FUNAFUTI, or Ellice Group, were discovered by Capt. Peyster, in the *Rebecca*, March 18, 1819. He named the one on which he was nearly wrecked *Escape Island;* the southernmost *Rebecca Island;* and the West, *Brown Island.* Wilkes visited the group in 1841, and describes it as an extensive ring of small islets, situated on a coral reef surrounding a lagoon. The islets are covered with cocoa-nut and other trees, which give them a sufficient elevation to be seen 10 or 12 miles off. The lagoon is 13 miles long N. by E. and S. by W., and 7¼ miles wide, and off its S.W. point, distant about a mile, is an islet 5 miles in length by 2 miles in width.

According to the report of the visit of H.M.S. *Basilisk* (1872), "this chain consists of thirty islets, one of which only, Funafuti, is permanently inhabited. It is situated on the N.E. quarter of the reef, and is from 8 to 10 miles in

length, but exceedingly narrow. The lagoon is of great extent, and possesses working room for any number of ships. All dangers are clearly discoverable in daylight, out of the glare of the sun. A small supply of brackish water exists on the island. The number of the natives is about 140—quiet, pleasant people." In 1881 the population numbered about 170.

Position.—Wilkes's chart places the N.W. point in lat. 8° 27′ S., long. 179° 13¼′ E.; East extremity, lat. 8° 31⅓′ S., long. 179° 21¼′ E.; South point of detached atoll, lat. 8° 39′ S., long. 179° 14½′ E. Observations taken by the officers of the German corvette *Ariadne*, 1878, place the church in lat. 8° 35′ 50″ S., long. 179° 10′ 40″ E.

The two channels leading into the lagoon on the S.W. side of the reef are not navigable for large vessels, but there is a good ship channel on the North and one on the South side of the reef. The *Rosario*, in 1874, passed through the North channel into the lagoon, the least water found being 5 fathoms. H.M.S. *Emerald*, 1881, found 4¼ fathoms least water. Native pilots reside on the South part of Ellice Island; if required, the usual signal should be accompanied by firing a gun.

To enter by the North channel, which is the narrowest but clearest, bring the extremes of the large island to bear S.E. ½ S. and E. ¾ S., when a vessel will be close off the entrance, which has on the West side a small sand kay with a few cocoa-nut trees, and a larger kay well wooded, having the appearance of two islands at high water, on the East side. The deepest water is about one-third the breadth of the channel from the West islet. From the entrance a S.E. by E. ½ E. course, altering occasionally to avoid three coral reefs, the southern of which is nearly awash, visible when the light is favourable, will lead to a position off the Mission Station (conspicuous white-washed buildings), distant about 7 miles. When nearing the anchorage several other reefs will be seen, extending about three-quarters of a mile from the shore; anchor to the northward of these.

Between the 3rd and 4th islets off the S.W. point of the large island, there is a good ship channel, having 7 fathoms deepest water, which is near the 3rd island or eastern shore. Between this passage and the Mission-house station there is only one shoal, which lies near the passage. When inside the lagoon, steer N.W. by N., to avoid a reef on the starboard hand, and when the North extreme of the 2nd island westward of Funafuti bears E.S.E., shape a course about N.E. ¼ E. for the anchorage. This channel is 3 cables wide, and 4½ fathoms was the least water obtained over an uneven bottom during an examination by the German corvette *Ariadne*, in 1878. Good anchorage may be obtained in the lagoon in 11 or 12 fathoms, coral and sand, at about three-quarters of a mile from the shore, with the Mission-houses bearing S.E. by E. ½ E., and the South point of the large island S.S.W.

The group of small islands off the S.W. point lies in a N.W. and S.E. direc-

tion. The westernmost island on the lagoon reef lies nearly 4 miles farther to the westward than was formerly supposed.

NUKUFETAU, or Peyster's Group, was discovered by the *Rebecca*, on her voyage from Nuku-Hiva to the East Indies. It is 8 miles long E.N.E. and W.S.W., and its greatest width is nearly the same. There is a good ship channel into the lagoon, one-third of a mile wide, least depth 5 fathoms, leading to an anchorage in 17 to 20 fathoms, sandy bottom, where a vessel may lie well protected by the reef. In order to maintain a mid-channel course, vessels should keep on the northern side of the entrance, as both flood and ebb streams set to the southward. H.M.S. *Emerald*, 1881, anchored in 16 fathoms, coral, off the principal village on the western islet of the group.

In the report of the visit of H.M.S. *Basilisk* (1872), the group is described as "consisting of eight or nine islets, situated on a reef of some 9 miles in diameter. The village is on the West side of the reef, near the entrance to the lagoon, and is the only permanently inhabited islet on the reef. The white-washed church, school, and native teachers' houses are only visible from the North and West side of the group. The tide in the ship channel was running out of the lagoon at the rate of from 4 to 5 knots." The population amounted to about 250 in 1881.

Position.—Wilkes places the extreme North island in lat. 7° 56′ S., long. 178° 27½′ E.; the South point of the atoll, lat. 8° 4′ S., long. 178° 28¾′ E.

VAITUPU, or Oaitupu, is the *Tracey Island* of an earlier period, and was for some time considered doubtful. Wilkes passed near it, but no survey was made; he describes it as well covered with trees.

The Rev. S. J. Whitmee says it is nearly round, about 4 miles across, and has a salt-water lagoon in the centre completely shut off from the sea by a ring-like strip of land about half a mile across. This island is evidently older than some of the others. Cocoa-nut palms are very abundant, and very productive; there is also a good supply of *taro*, and some bananas. The population, amounting to 376, are very advanced. "Before we went ashore, we were struck with the appearance of the settlement, which is very pretty. A stone chapel, 160 ft. long by 60 ft. wide (large enough to hold three times the population of the island) has been built behind the village, to replace the old chapel which stood near the sea."

The island is surrounded by a reef with no outlying danger; there is anchorage off the N.W. extreme, but landing is bad, except in canoes; no supplies and no water.—H.M.S. *Rosario*, 1870.

The natives state that there is anchorage in 11 fathoms, in a bight of the reef off the village on the S.W. side of the island. In 1878 there were 490 natives, and one European was residing here as agent for Messrs. Godeffroy.

Wilkes' chart places the South end in lat. 7° 32′ S., long. 178° 46′ E.; North end, lat. 7° 26′ S., as do the missionaries. The island is reported to lie 6 miles westward of its present position on the chart.

NUI, Netherland, or Eeg Island, was discovered in 1825, by the Dutch frigate *Maria Reigersbergen* and the corvette *Pollux*. The Russian captain, Chramtschenko, ignorant of the Dutch discovery, named it *Lowendahl Island*, in 1829, and placed it in lat. 7° 13′ 20″ S., and long. 177° 14′ 30″ E.

The Rev. S. J. Whitmee says "it is a single island, nearly circular, with a lagoon on one side of it—partly open to the sea, but with no entrance for ships. Its productions are similar to those of Vaitupu, and very abundant. The people are very different from those peopling the rest of the Ellice group. All the other islands have been peopled from Samoa; the Samoan language is the basis of theirs, and they have traditions of their forefathers being drifted from Samoa to Vaitupu, whence they spread to the other islands. On Nui the people trace their origin to the Gilbert group, and they speak the language of that group, which is totally different from the Samoan. The people are Christian, and number 202."

The report from the officers of H.M.S. *Basilisk* (1872) describes it as follows:—"The form of the reef is a crescent; the islets, six or seven in number, being situated on its circumference. The N.W. and S.W. horns of the crescent are joined by a long connecting reef, through which there is no passage. The village, together with the church and school-house, are on the S.W. islet. No other islet is permanently inhabited, but a sanitarium for the islanders exists on the South side of the group. The houses can be seen from the sea, and must not be mistaken for the village. Boats generally find a difficulty in landing." No anchorage exists off Nui.

NIUTAO has been called *Lynn* or *Lynx* and *Sepper Island* by whalers, and *Speiden* by Wilkes, who says it is a small island with no lagoon.

The Rev. S. J. Whitmee says "the island is of similar formation to the others, but has, I am told, two lagoons. I saw one; it is very shallow, and not more than 1 mile across. The belt of land is not less than three-quarters of a mile to 1 mile broad. This lagoon is situated at one end of the island, and I was told there was a similar one at the other end, but I had no time to visit it. The island is plentifully supplied with cocoa-nut palms and pandanus, but there is not much besides of an edible nature. The natives are heathen, and go about naked. Population about 360."

During the visit of H.M.S. *Basilisk* (1872)—"this island was found to be 20 miles W. by S. of its position on the chart. It is about 2½ miles long by 1½ broad, densely covered with cocoa-nut trees. A narrow shore reef extends all round the island, on which a heavy surf runs, rendering landing impossible, except for canoes. The population consists of 417 souls, governed by a king and chief. The missionaries have recently landed on the island. A small quantity of brackish water, which filters into their wells at high tide, is the only water on the island. The people are quiet and inoffensive. The village

is on the West side of the island. Pigs and fowls are plentiful." The best landing place is close northward of the West extreme of the island.

Wilkes, when passing Niutao, made it in lat. 6° 10′ S., long. 177° 41′ E., in which position it has remained until recently. The missionaries consider it to be in lat. 6° 8′ S., long. 177° 22′ E., which agrees with the observations of H.M.S. *Basilisk's* officers. From observations made by the officers of H.M.S. *Emerald*, 1881, the church is considered to be in lat. 6° 6′ S., long. 177° 20′ E.

NANOMAGA, or Hudson Island, is probably the *Gran Cocal* of Maurelle (1781), who describes it as small, low, and encompassed by reefs and rocks. It was seen by Duperrey, and afterwards by Chramtschenko. Wilkes (1841) describes it as *Hudson Island;* "it is 1½ mile long, North and South, and nearly a mile wide, East and West. It is inhabited, a few natives being seen on the beach, and several houses under cocoa-nut trees on its West side. It is of coral formation, has no lagoon, and can be seen about 8 or 10 miles off. There are reefs extending from its North and South points, nearly half a mile, on which the surf breaks heavily."

"A narrow shore reef, with an unusually precipitous face to seaward, extends round this island, rendering landing difficult. Native missionary teachers are here established. The village is on the West side."—H.M.S. *Basilisk* (1872).

Position.—Duperrey gives lat. 6° 5½′ S., long. 176° 13′ E.; Chramtschenko, lat. 6° 12½′ S., long. as Duperrey. Wilkes gives lat. 6° 19′ S., long. 176° 23¼′ E.; the *mean* is lat. 6° 12′ S., long. 176° 16½′ E.

Grand Cocal Shoal.—There can be no island between Nanomaga and Nanomea; the tracks of vessels disprove any such thing, and the missionaries would know if there were. "After a careful search for Grand Cocal Island (in H.M.S. *Basilisk*), in clear favourable weather, passing over the position assigned it on the chart, it could not be found. But at St. Augustine Island Capt. Moresby learned from an English sailor, resident there, that as an island it did not exist; but there was an extensive shoal, 3 or 4 miles in circumference, somewhere between St. Augustine and Hudson Islands, with from 5 to 7 fathoms water, on which, in heavy weather, the sea breaks. The man stated that he had frequently sailed over this shoal and seen the bottom." It is placed on the chart nearly midway between the islands, but rather nearer to Nanomaga.

NANOMEA.—This is the northernmost of the Ellice group; it is probably the *San Augustin* Island of Maurelle (1781), and *Taswell* and *Sherson* Islands of the brig *Elizabeth* (1809). Duperrey (1830), and Wilkes (1841) saw it and gave its position.

The Rev. S. J. Whitmee (1870) says "there are two islands within 3 or 4 miles of each other connected by a reef, dry at low water. The westerly island is named *Lakenu;* it is nearly round, 2 miles or more across, well stocked with cocoa-nut and other trees, and has a deep *fresh-water* lagoon in

its centre. It is not inhabited, but is used by the people of the other island for the cultivation of food. *Nanomea*, the second island, is about 4 miles long, by 1 to 2 wide; it has a shallow salt-water lagoon towards the East end, partially open to the sea.*

"The inhabitants are, taken together, the finest race of men, so far as muscular development goes, I have ever seen. They are almost a race of giants. I believe nine out of every ten would measure six feet or more high, and their breadth is proportionate to their height. The Englishman resident on the island estimates the population at about 1,000."

The brief observations of Wilkes are, "that the small island of St. Augustin appeared to be well wooded."

The officers of H.M.S. *Basilisk* (1872) describe it as "consisting of a coral reef of an extended crescent form, with two principal islets on the N.W. and S.E. horns; a third small islet lies between them. Reefs, half a mile in extent, run off the S.E. and N.W. extremes of the island. The village is on the eastern side of the S.E. islet, off which extends a broad shore reef, springing up as a wall of coral from the depths of the ocean; on this the sea breaks furiously. At intervals the surf, it is said, subsides so as to allow boats to land. The population is about 450; they have steadily resisted the introduction of missionaries, and have an evil reputation for stealing and treachery."

Maurelle, the discoverer, made it 10 to 12 miles long N.E. and S.W.; the length agrees with that given by the missionaries, but not the direction. Anchorage may be obtained on a bank of soundings off the North side of Lakena.

Position.—By Maurelle, lat. 5° 35′ S., but his long. is at least $2\frac{1}{3}$° in error; by brig *Elizabeth*, lat. 5° 36′ S., long. 176° 20′ E.; by Duperrey, lat. 5° 39′ 10″, longitude 176° 6′ E.; by Wilkes, lat. 5° 35′ S., long. 176° 6′ E.; according to the missionaries, lat. 5° 38′ S., long. 176° 17′ E. In no instance is the exact spot indicated; therefore, until more is known, the best position will be, *centre*, lat. 5° 36½′ S., long. 176° 10′ E.†

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* The brig *Elizabeth* made Taswell Isle (West side) in lat. 5° 37′ S., long. 176° 9′ 34″ E., by chron. and lunars. Sherson Isle, about 4 to 5 leagues S.S.E. of the former, appeared more extensive, was well wooded, and very low; its direction about N.W. and S.E.

This closely corresponds with the Rev. S. J. Whitmee's description of Lakena and Nanomea: and I am therefore not inclined to regard Sherson as the Gran Cocal of Maurelle, or the Nanomaga (Hudson Island) of Wilkes and the missionaries; indeed Sherson cannot be Nanomaga, for this latter is undoubtedly smaller than Nanomea; while if Taswell is taken to be Nanomea, and Sherson to be Nanomaga, the reverse would be the case. I have no doubt that Taswell is Lakena, and Sherson is Nanomea—together forming the group Nanomea.—"Mercantile Magazine," September, 1873, page 257.

† Reported Islands westward of Ellice Islands.—*Jesus Island* (?) was discovered by Mendana in the year 1565, placing it in lat. 6° 45′, and 160 Spanish leagues from the Baxos de Candelaria. Krusenstern places it, in the list of his doubtful positions, in lat. 6° 45′ S., long. 171° 30′ E.

Nameless Island (?) is another doubtful position, lat. 2° 50′ S., long. 170° 18′ E.

The GILBERT ARCHIPELAGO (which is described in the volume relating to the North Pacific) lies to the northward of this group, the distance between the extremities of the two archipelagoes, St. Augustine and Hope or Hurds Island, being about 180 miles.

Kotzebue thought that some land intervened in this space, when he passed over it in his second voyage:—"From lat. 5° S. to the equator, we daily perceived signs of land. When in lat. 4° 15′, and long. 178°, heavy gales brought swarms of butterflies and small land birds to the ship. We looked in vain for land; therefore this discovery remains for some future navigator." No other islands, however, have been discovered hereabout.

PAANOPA, or Ocean Island, was discovered in 1804 by the vessel of the same name. It is of a circular form, high in the centre; has no harbours or anchorage, and is steep-to all round, clear of hidden dangers. It is about 10 or 11 miles in circumference, and thickly inhabited by a race similar to those of Pleasant Island. In November, 1845, there were seventeen white men living here, several of whom were runaway convicts from New South Wales or Norfolk Island. Cocoa-nuts and fowls may be obtained at this island at a moderate price; but strangers should be on their guard against treachery, more especially at islands where reprobate white men are found domesticated with the natives. The island can be seen 25 miles distant in clear weather.—*Capt. A. Cheyne.*

M. Dutaillis says that vessels in need of refreshments cannot get water here; they may increase their crews, and get what they require, keeping under sail. The North part of the island is scarcely approachable. The beach is backed by a cliff 15 or 20 ft. in height. The South part, on the contrary, slopes towards the sea, and is intersected by sandy beaches, favourable for landing and launching the slender and beautiful canoes of the island, which was probably in former times healthy and prosperous, but now overcome by evils; the inhabitants, 450 in number, have fresh wants, which cannot be easily satisfied.

The position is given by Capt. Cheyne as lat. 0° 48′ S., long. 169° 49′ E.; but M. Dutaillis says its centre is in lat. 0° 52′ 2″ S., long. 168° 24′ 25″ E.

PLEASANT ISLAND, or Nauru, was discovered by Capt. Fearn, in the *Hunter*, 1795, and is probably the *Shank's Island* of 1801. According to observations made in 1845, by Capt. Cheyne, it is in lat. 0° 25′ S., long. 167° 5′ E. Capt. T. B. Simpson makes it in lat. 0° 35′ S., and, according to his dead reckoning, it may be 15′ W. of his assigned position. It is 15 miles in circumference, rather low, covered with cocoa-nut trees, and of a circular form. A fringing reef projects from the shore about 200 yards all round the island. It has neither harbour nor anchorage, is steep-to on all sides, and clear of hidden dangers. On approaching it two round hummocks, some distance apart, are first visible; and, as it was approached from the S.E., a very remarkable solitary

tree, towering above all others, made its appearance on the East extremity of the island. It is thickly peopled by a good looking race, of a light copper complexion. The number was estimated at 1,400 in 1841. To a stranger they appear inoffensive in their manners; but, notwithstanding their mild appearance, they are not to be trusted, as they have succeeded in cutting off ships at this island, it is said, through the aid and instigation of runaway convicts. A good supply of cocoa-nuts and poultry may be obtained.

Vessels touching here should be on their guard, and not allow many natives on deck. There were two white men living here in 1845; there were seven in 1843. As above stated, many of these men were the worst of characters, and had instigated the natives to commit many atrocities, as well as to enact many among themselves. On December 4, 1852, they seized the brig *Inga*, of New Bedford, and after murdering the captain and most of the crew, they set fire to the ship; but it is said that this arose from the treatment some of the natives received while on board. We can only repeat the caution above given.

However, from the reception which Capt. W. Hall, of the barque *Glenisle*, met with in August, 1869, it appears that the people are now more to be trusted. He says:—"I spoke to the Englishmen about the island having a bad name, and they told me it was owing to a man named Jones who had been taken off the island by a man-of-war. They told me that they try to visit all ships that pass within an easy distance, and seemed to be very anxious for it to be known that they could supply ships with pigs and cocoa-nut oil. I told them they ought to try and cultivate potatoes, which they said they would do." —*Nautical Magazine*, January, 1870, p. 2.

Mattoetee (*Motu-iti*?) or *Kennedy Island*, was discovered by the *Nautilus* in 1801; it is stated to be in lat. 8° 36′ S., long. 167° 5′ E.; but the position requires confirmation. Another authority places it in 167° 48′ E.

Marex Reef or *Island*, another doubtful position in lat. 8° 25′ S., long. 165° 32′ E., was announced in the China Mail, but is otherwise unsupported.

CHAPTER XVIII.

SOLOMON ISLANDS, NEW BRITAIN, NEW IRELAND, ETC.

SOLOMON ISLANDS.

It is to the celebrated Mendaña, frequently alluded to in this work, that the honour of discovering this archipelago is due.

On the 10th of January, 1567, Don Alvaro de Mendaña left Callao in two ships (whether more is not specified), and after discovering a small island, Jesus Island, they came upon some reefs, Baxos de Candelaria (Candlemas Shoals), and thence sailed until they came to a port, Sta. Ysabel de la Estrella (St. Isabella of the Star), on a land of great extent. It was inhabited by a race of the complexion of the Mulattoes, who lived on cocoa-nuts and roots apparently, but it was believed without much animal food, for the chief sent the general a present of a quarter of a boy, with the hand and arm; this was immediately buried, which gave great offence.

The name, Solomon* Islands, it would appear, had been applied to some earlier discovery, but subsequently it was given to the whole of the group, "to the end that the Spaniards, supposing them to be those isles from which Solomon fetched gold to adorn the temple at Jerusalem, might be the more desirous to go and inhabit the same." But they were not revisited by Europeans till two centuries after their discovery.

Their position and real character remained uncertain till Carteret, in 1767, in sailing from Lord Egmont or Santa Cruz Island for New Britain, discovered Gower, Carteret, and Simpson Islands, without suspecting that they formed a portion of the much vaunted Solomon Islands. The voyage of Surville, in the *St. Jean Baptiste*, in 1769, first put an end to the uncertainty of the calculations made for their situation, which varied more than one-third the breadth of the Pacific. Bougainville, 1768, discovered the northern part of the islands. In 1788, Lieut. Shortland also made numerous discoveries. A cursory

* In all the original accounts of this group the name is spelt Salomon.

examination was made, under sail, by the celebrated and unfortunate Admiral D'Urville, in his last voyage in the *Astrolabe*, in 1838.

More recent information we obtain from Captain Denham, R.N.; from the Reverend Mr. Kerr and Lieut. Tilly, who visited the islands under the direction of the Melanesian Mission; and from the reports of the officers of H.M. ships engaged in the surveys during the years 1879 to 1882.*

The *Solomon Archipelago* extends N.W. and S.E. for the space of 600 miles. It is composed of eight or ten principal islands, and many others less considerable, but the number of which is not yet properly known.

The structure of these islands is throughout the same; it is a long chain of mountains, often very lofty, which form their axes in the general direction of the group. On either side the slopes incline gently towards the sea; the shores generally appear low, and often furnished with a belt of mangroves, the edge of which is washed by the salt water. An active and vigorous vegetation covers the whole of the land, and it is only here and there that in rare intervals the soil may be seen, or only covered with ferns, or often consumed by fire intentionally. The principal islands have all the advantages of extensive land; extended plains and large rivers descend from the hills; and, if we may judge by the trees which cover the land, the soil is of great fertility, and rain abundant.

The population of the Solomon Islands appears to be very irregularly distributed on the islands composing the archipelago, for while San Christoval, Bougainville, and Bouka, are apparently well inhabited, Malayta, Ysabel, and Choiseul, seem to have much fewer than their lands would afford sustenance for. The population does not appear to be confined to the sea-shore only. The character of the natives is very difficult to fix, for though they may be generally alike, still they differ much in different parts of the archipelago. They are skilful in carving, and most of their implements are inlaid with the mother-of-pearl shell. No large supply of yams can be depended on at any of the Solomon Islands, where the soil is not so deep as in the New Hebrides.

"The character of the natives of these islands has been already stated by others to be the most treacherous and bloodthirsty of any known savages; they are throughout cannibals, and the main object of their lives is to take each other's heads. They are not, however, what can be called a courageous people, such a thing as a stand-up fight between two tribes being unknown. They are like wild beasts, always prowling about for prey, but rarely attacking unless they feel they have their victim in their power without risk to themselves; at the same time war parties will go long distances in their canoes, and make raids

* Interesting accounts of visits to several islands of this group will be found in the following works:—"Jottings during the Cruise of H.M.S. *Curacoa*," by Mr. J. L. Brenchley, pp. 248—293: and "Wanderings, South and East," by Mr. Walter Coote 1882, pp. 168—191, and 205.

upon neighbouring islands, an undertaking which must necessarily be attended with considerable risk.

"The whole of the natives of these islands are the same race, namely Papuans; they vary, however, a good deal as to colour, some being a deep black, and others a very light copper colour: this is especially the case on the North coast of New Britain. The natives of this island are also by far the finest we have seen, next to them the natives we saw on the S.E. coast of New Guinea."—*Capt. Simpson*, H.M.S. *Blanche*, 1872.

A British naval depôt has been established at Treasury Island, in the Solomon group. This arrangement is regarded in Australia as implying virtual annexation.—*Daily Telegraph, January 18th*, 1884.

Winds and Currents.—The Solomon Islands lie within the range of the westerly monsoon, westerly gales and rainy weather succeeding the S.E. winds; and whalers which gradually get down to leeward, or to the N.W., in the fine weather or S.E. trade season, run back again before this westerly wind. From June to September, the *Southern Cross* occasionally had light westerly winds and fine weather for several days together.—*Lieut. Tilly.*

Capt. Simpson, H.M.S. *Blanche*, says:—"During the months of July and August, fine weather was experienced on the whole amongst the Solomon Islands, New Britain, New Ireland, and New Hanover; to the S.E. of these islands the south-easterly breeze strengthened, and a great deal of rain fell. The currents, which were seldom strong, appear to be entirely dependent for their force and direction upon the wind and formation of the islands, except amongst the Louisiade Archipelago and the islands at the S.E. point of New Guinea, where a strong westerly set of 1½ mile an hour was experienced."

The following observations on the winds, &c., have been given by M. Dutaillis:—"Rear-Admiral D'Urville, in his exploring voyage, found the westerly winds regular at the Solomon Islands during the month of November, and remarks upon their extraordinary duration. I can add that they generally commence in the month of September, and continue until the month of March.

"After they have set in for some time there is a very strong current between this archipelago and those of Santa Cruz, Mendaña, &c. We have found it, at times, to be above 40 miles in the twenty-four hours, and setting invariably to the E.N.E. or N.N.E., according as we were nearer or farther off the island of San Christoval. In these parts, as well as in Torres Strait, the gales of wind from the western quarter are very violent."

The S.E. trade wind prevails from April to December, or the latter end of November, most frequently from E.S.E.; but from local information, obtained by the officers of H.M. ships *Renard* and *Lark*, the wind has not been so steady latterly, either in force or direction as in former years. To the southward of San Christoval Island, in the early part of this season, light airs and calms prevail sometimes for many days. Towards the end of the season there is occasionally much rain and squally weather, the barometer being but little affected.

Westerly winds prevail from December to March, blowing strong in January and February, and much rain falls; during this season violent squalls from W.S.W. are frequent.

During the season of south-easterly winds, the current generally sets to the S.W., but it is irregular. H.M.S. *Diamond* found a current setting to the southward 1 knot per hour, in the channel between Guadalcanar and San Christoval Islands, upon each of the three occasions of her visit in 1882.

The force of the *currents* has been also described by Capt. Le Mignon, of the *Jupiter*, in April, 1846. "From Mitre Island to the eastern cape of San Christoval we had each day a current of 24 to 25 miles to the East; from the 16th to the 22nd we continually sailed with terrible weather from the S.E. to the N.E. We kept within sight of the high lands of the Solomon Archipelago, and reached, on the 17th, near Bougainville Island, where we met with calms, storms, and violent squalls, much to be dreaded on account of their irregular direction. To the South of the Solomon Archipelago we experienced as much as 45 miles of current, bearing to the South, in the twenty-four hours, and 35 to 40 miles of easterly current. We here met with some enormous trees, capable of sinking a ship should they strike her."

Santa Catalina, or *Y-Oriki*, the southernmost of the Solomon Islands, is about 2 miles long, East and West, 320 ft. high, and cannot be perceived more than 10 or 12 miles distant. Both this and Santa Anna are much wooded, and covered, near the shore, with a forest of cocoa-nut trees. The canoes are admirable for their lightness and grace; manned by only four natives, they easily kept up with the ship, going at the least at the rate of 4 knots. Lat. 10° 53½′ S., long. 162° 25½′ E.

Santa Anna Island, or *Ou-ah*, is 4½ miles eastward of the S.E. point of San Christoval, and 2 miles northward of Sta. Catalina; its summit is 520 ft. above the sea, and may be seen at 25 or 30 miles off. It is of volcanic origin, and the inhabitants are well disposed.

Port Mary, on the West side of Santa Anna, affords good anchorage in 14 fathoms, sandy bottom, about 4 cables from the village; this anchorage, although open to the N.W., is protected by the reef stretching across between each point of the harbour. The passage is contracted by a patch lying off the South reef, but there is sufficient space for a vessel to pass through. On the South side of Santa Anna there is a large village named Poonah, off which sunken patches are said to extend nearly half a mile from the fringe reef. Lieut. Tilly says that a reef extends off the North end of the island, enclosing a deep basin, where the natives build large war canoes. During the visit of H.M.S. *Dido*, in 1873, the natives were friendly but suspicious, being armed with bows and spears. A little fresh water may be procured here.

In 1877 a vessel was hauled ashore and cleaned in Port Mary, and the na-

tives were very friendly. Several Europeans have lived on the island, and nearly all the people can speak a little English.

SAN CHRISTOVAL ISLAND, Arossi, or Robatu, is the first of the larger islands in coming from the S.E. Its southern side was examined by D'Entrecasteaux, and its north-eastern side by D'Urville, in 1838. From the observations then made, the island appears to be 76 miles long W.N.W. and E.S.E., its greatest breadth being 23 miles. Its highest peak is 4,100 ft. high. Lieut. Tilly says this island is much resorted to, the harbour of *Makira* on the western side being frequented by whalers.

Cape Surville, as it is called by Fleurieu, after its discoverer, is the S.E. point, and in lat. 10° 50′ 40″ S., long. 162° 21′ 14″ E., and is the eastern extremity of a long, narrow peninsula. The coast of San Christoval, to the northward of this, D'Urville says, is well peopled, and has a very pleasant aspect. Clumps of cocoa-nut trees abound, and under them are a great number of small huts and stages supported on wooden columns. Extensive forests cover the land, which rises from the shore to the summit of the mountains in the form of an amphitheatre. The height of these mountains was 1,614 and 1,552 ft. A line of breakers reaches off the coast all along, but rarely extends more than half a mile, except off the North side of the peninsula, where they appear to extend for at least a mile.

Cape Keibeck, or *Kahua*, is in lat. 10° 28′ S., long. 162° 2′ E.; immediately to the westward of it the coast runs in to the S.S.W. nearly 3 miles, forming a large bay; and from the discoloured appearance of the water and nature of the coast, a large stream was supposed to empty itself into the bay. The district to the West of Cape Keibeck is called "Bauro," and some 10 miles from it are several villages close to the shore. The country hereabout seems rich, a vast plain covered with cocoa-nut trees running inland between two chains of high mountains. No dangers were seen between Cape Keibeck and Maroo Bay, at the N.W. extreme of San Christoval, beyond the fringe reefs extending a short distance from the points. The mountain ranges are exceedingly uneven and irregular.

In lat. 10° 23½′ S., long. 161° 43′ E., is *Maoraha Islet*, with trees 50 ft. high, and reefs off its northern and eastern sides. This locality was surveyed by Lieut. Heming, H.M.S. *Lark*, 1882, and anchorage was found in about 20 fathoms at 1½ cable W.S.W. from the South end of the island, which lies half a mile from the coast, with a 2¾-fathoms patch in mid-channel.

Wano Bay lies on the North coast of San Christoval, in lat. 10° 18′ S., and 15 miles E.S.E. of Cape Recherche. The anchorage seems well protected from the usual trade wind, and good fresh water may be obtained.

Cape Recherche, the northernmost point of San Christoval, is in lat. 10° 10′, long. 161° 19½′ (approx.). The country near the cape appeared to be thickly inhabited; a great number of huts and stages were built beneath superb clumps of cocoa-nut trees.

Maroo Bay has anchorage in it, at 3 miles S.W. of Cape Recherche, and here fresh water may be obtained. *Recherche*, or *Hada Bay*, has also a stream running into its head, in lat. 10° 15′ S. It lies 5 miles S.S.W. of Maroo Bay, with a promontory between. The anchorage is about 4 cables N.W. of the river. "Hada or Recherche Bay, though very small, is snug and safe; the high cliff on either side is picturesque, and densely covered with wood, and at the bottom of it is a flat, well-wooded beach, backed by lofty hills. H.M.S. *Curaçoa* anchored in 14 fathoms."—*Brenchley*. The natives were not so friendly as at Wanga (Wano), where tobacco, pipes, and fish-hooks were much in request.

Iles du Golfe are two in number; the largest, *Ugi*, about 6 miles long N.N.W. and S.S.E., is tolerably high, the summit, 670 ft., being in latitude 10° 15′ 0″ S., long. 161° 43′ E.

Anchorage may be found in 27 fathoms in *Selwyn Bay*, off the village of *Ete-ete*, on the western side of Ugi, from whence good water, yams, and pigs can be procured. H.M.S. *Curaçoa* visited the island in 1865, and found the natives friendly; in 1881 they were estimated to be 900 in number. A sketch survey of this anchorage was made by Lieut. Hughes, H M.S. *Cormorant*, 1881. About half a mile northward of the village is a trader's hut and store, and there is anchorage in 16 or 17 fathoms, sand, during the S.E. monsoon, at 2½ cables W. by N. of them, and 1½ cable off shore. In the N.W. monsoon the anchorage is in the same depth in the northern part of the bay, but boats cannot land then. The best watering place is 6 cables southward of Ete-ete. The shore is thickly wooded.

The channel between Ugi and Biu Islands is described by the Rev. Thomas Kerr, R.N., as being a good one, but it was not used by the *Southern Cross*, as it appeared full of tide rips. A reef extends a short distance out from the N.W. of Ugi Island; in other parts the ordinary fringe reefs run out from a quarter to half a mile off shore. *Biu* lies 2 miles N.W. of Ugi; it is about 1½ mile in length, rising to a height of 240 ft.

The *Trois Sœurs* (Three Sisters), 230 to 250 ft. high, lying to the East of the Iles du Golfe, and 10 miles northward of San Christoval, were discovered and named by Surville. They are flat, marshy, densely wooded, and uninhabited, extending over a space of 9½ miles N.W. by N. and S.E. by S.

On the S.W. side of *Malaupaina*, the South island, there is a lagoon, about a mile long, and half a mile broad, but there is no ship passage into it; a bar, consisting of sand, coral, and boulders, having less than 6 ft. on them, stretches across the entrance, near which there is 9 and 10 fathoms, shoaling to 2½ and 3 fathoms. H.M.S. *Alacrity* obtained an anchorage, formed by the points of land and spurs of the reef, outside the lagoon, in 25 fathoms. This anchorage was surveyed by Lieut. Heming, H.M.S. *Lark*, 1882. It is sheltered on the West by a detached reef, dry at half-tide, and is known as *Mosquito Anchorage*.

Lark Shoal, upon which a depth of 7 fathoms was found, extends 1½ mile

North and South, and lies N. by E. ¼ E. distant 10 miles from the summit of Alita, the northernmost of the Three Sisters Islands.

Ulaua, or *Contrariété Island*, was discovered by Surville, but very vaguely announced. It is about 26 miles to the N.N.E. of Ugi Island, is about 7 miles long, North and South, and 3 miles broad; it is quite flat, of moderate height and steep-to, with a good lee and smooth water along its western side. Water and pigs may be obtained at *Tuhia* on the West side, about 1½ mile from the South point; also at *Hasimo*, about half a mile further to the northward. There is anchorage at *Noro-noro* on the North coast. The natives, who are friendly, are the principal canoe makers in this group, and very skilful in the production of personal ornaments.

The S.W. side of San Christoval trends nearly due West for the space of 17 miles, it then takes a W. by N. direction, and then N.W. by W. It presents to the view a great number of tolerably deep bays, but they are all open to the southerly winds. To the West of *Cape Sydney* (lat. 10° 44½′ S., long. 161° 45′ E.), however, is a bay, the shore of which was formed by a fine sandy beach, and there is reason to believe that it may be sheltered from the prevalent winds.

Point Philip is in lat. 10° 31′ 23″ S., long. 161° 26′ 35″ E. (Denham), and is the S.E. point of a bay 16 miles in extent, and 5 miles in depth. Its N.W. point, *Point Achard*, is still more steep than any of the land seen to the southward. The sea broke violently against it; and to the East of it is a sandy beach, on which the breakers formed a heavy bar. Shoal water extends for 1 or 2 cables off Point Achard. From this point the coast trends directly to the North to Cape Recherche.

Makira, or *Leoue Bay*, probably one of the best and safest harbours in the group, was surveyed by Captain Denham in December, 1854. He made the position of Makira to be in lat. 10° 25′ 23″ S., long. 161° 26′ 9″ E. It may be recognised by *Eyo*, a remarkable little island having a knob on one end, to the northward of the harbour, and Philip Island to the southward. From the inner S.E. point of Makira Harbour, a shoal, with apparently not more than 6 to 12 ft. on it, extends about 3 cables in a south-westerly direction, thence South toward Philip Island. In the passage between Philip and San Christoval Islands there are numerous shoals, but it is sometimes used by vessels having local knowledge. Near Observatory Point lies a detached rock, and when seen clear of the trees overhanging from the shore, leads to the southward of Passage Ledge.

During the S.E. trade wind the rise and fall in Makira Bay is 4 ft., and in the wet season, with westerly winds, the rise is 7 ft., when the current outside the harbour sets S.S.E. 2 knots an hour.

The ensuing account is given by M. Dutaillis, of the French ship *L'Ariane:*—

The strait which forms its entrance is open from the West to S.W., and forms a gullet, the narrowest part of which serves as a passage to the anchor-

ages North and South of this position. Fifty vessels of any magnitude may readily find anchorage and shelter from wind and sea, and make any repairs here.

In the North part, named *Makira*, where the missionary establishment was, but which was abandoned from the hostility of the natives, there are several watercourses, of most excellent quality, and the shore is so steep that the boats can lie against it, and take in the water with an ordinary hose. Small quantities of provisions can be obtained from the natives. There are several rivers which enter the sea around the bay. In front of Makira is the village of *Jone*. Some houses, called *Maraugoa*, exist also in the South part, on the sides of a bay which is very convenient for heaving down ships. It lies to the West of an island called *Asouni*, at 1½ mile from the village of *Jone*.

The *Bay of Sainte Marie* is very difficult to make out from the offing, because it is so confounded with the high lands surrounding it on all sides.

In coming from the West you must keep *Point Achard* (forming the N.W. extremity of the gulf) on the bearing of N. 60° W., *true;* and, in coming from the East, rounding *Capes Philip* and *D'Entrecasteaux*, as well as the island outside of it, bring also Cape Philip to bear S. 10° E., *true*. The junction of these two bearings will be at the western extremity of the bay. From thence to the passage it is not more than 1½ mile, and 2 miles to the anchorage. When once within the gullet, you may anchor on either side, so that it is very near the land.

After passing Point Achard, which can be distinguished by the white sand beach to the eastward of it, a high double peak will be seen, which should be steered for, bearing S.E. by E. ½ E., and the entrance to the harbour will be seen, having two small islets lying off the N.W. point. The wind is generally light and baffling under the high land, but a light land breeze in the early morning, enables a vessel to get out of the port before the sea breeze sets in.

MALAYTA ISLAND* is to the north-westward of San Christoval, and, according to D'Urville's and later observations, is 103 miles in length N.W. and S.E. Its two extremes are named after D'Urville's ships. The island is surmounted in the interior by high summits covered with wood; the shores are low, and lined with mangroves, the feet of which are often washed by the waves. The shores seemed to be but thinly inhabited, and a few canoes vainly endeavoured to reach D'Urville's ships. The interior presented several ranges of hills, which showed that the island was of a considerable breadth. *Mount Kolowrat*, the highest summit, 4,274 ft., is in lat. 9° 6′ 30″ S., long. 160° 57½′ E.

Cape Zelée, the southernmost point of Malayta, is in lat. 9° 45′ S., long. 161° 30′ 24″ E. It is a low, wooded point, sloping down from the high land. About 13 miles north-westward from Cape Zélée is a channel across Malayta,

* Malayta, or Malaita, was a name imposed on this island by Ortega, sent thither by Mendana, and is evidently the *Terre des Arsacides* of Surville; but this latter appellation must give way to that of its discoverer.

insulating the S.E. portion, which is called *Maramasiki*. At 3 miles North of Cape Zélée is *Saa*, on the eastern coast of Maramasiki, where there is landing in fine weather at a white beach. When it is too rough off Saa, the natives communicate with the ship from the western side of the island, at *Te Waina*, a little North of Cape Zélée. *Te Oroha*, a boat cove, lies 3½ miles N.W. from Cape Zélée, and may be known by the cocoa-nut trees. *Su Oroha*, a mile northward of it, is said to have anchorage in 5 fathoms, in a bight running in to the N.E. *Su Paina Bay*, or *Great Harbour*, 5 miles N.W. from Su Oroha, is bounded on its western side by *La Raro Point*, which may be known by its white beach. It is said to have anchorage at its head in 5 fathoms, but is open to the S.E., and consequently to the prevalent wind. *La Raro Banks* are two or three extensive patches of 2 and 4 fathoms, extending 5 miles to the S.E. of *Cape Hartig*, or La Raro Point. They have channels between them, and their southern end lies W. by S. ½ S. from Cape Zélée.

About 1 mile N.W. of La Raro Point is a small white beach, known as *Teri-ari*, and a little farther on are two islets with an opening, apparently a lagoon, beyond them called *Tawa-ni-ahia*, and another beach to the N.W.; from this the coast runs N.W. about 3 miles to the channel said to divide Maramasiki from Malayta proper. Two white beaches on the Malayta shore mark the entrance of this channel, which from the offing does not appear to be of any importance.

The Coast of Malayta thence runs to the N.W., and 9 miles from its southern point is a small opening with a spit off it, known as *Mari-Wai*, nearly abreast of the peaks called *Saddle Range;* from this the coast trends back a little N.W. by W. for 4 miles to *Hocoi-Wai*, next out N.W. by W. ¼ W. 10 miles, and then runs in a general direction of N.W. ¼ W. A larger opening than usual, out of which a few small canoes came, lies 3½ miles to the N.W. of Hocoi-Wai.

The shore is uniform, low, and wooded to the water's edge, with frequent openings or lagoons, all faced with the usual fringe of reef, and apparently of little importance; few natives were seen, and they appeared very shy; the absence of cocoa-nut trees, usually a sign of inhabitants, seems to indicate a small population.

The mountain ranges are rugged, changing their appearance considerably when viewed on different bearings. The Three Peaks in lat. 9° 22′ S., long. 161° 6′ E., are about 2,600 ft., and the Saddle Range near Mari-Wai 1,800 ft. above the sea.

No outlying shoals were seen on this coast, and the *Southern Cross* worked through this part of Indispensable Strait, in 1867, without observing any indications of shoal water.

Wai-ro-kai lies in lat. 9° 20′ S., long. 161° 0′ E. About 4½ miles to the N W of it the coast is low and fringed with trees, and some 4 miles to the N.W. is an opening, probably into a lagoon.. About 5 miles further to the N.W. is

another opening, in lat. 9° 10′ S., long. 160° 51′ E., with a white beach on its western side, from which the natives came out to the ship; they called the place *Bau*, or *Bauna*. Between the last opening and *Bauna* are low cultivated ranges, and a high peak inland.

The coast line now trends N.W. ½ N. some 9 miles to the S.W. point of Alite Bay; at more than half-way is a small islet with white beaches, lying close to the coast, and inland are three peaks near each other, with higher uneven mountains lying farther back. Off the South point of Alite Bay is a small fringe reef, and the shores of the bay seemed to be rough and broken.

Alite Bay runs nearly N.N.W. and S.S.E., with four islets lying across the entrance of the bay, of which the two middle ones are the largest. The natives were friendly and wishing to trade. A sketch survey of this harbour was made by Sub-Lieut. Messum, R.N., in 1882; there was anchorage near the middle of the harbour, which is about 6 cables in diameter. There is a break in the chain of mountains near Alite Bay, and northward of this the coast seems more inhabited.

Bejean, or Alite Reef, is a dangerous reef awash, running some 4 miles in length N.N.W. and S.S.E., and 1½ mile wide. Its N.W. extreme, in lat. 8° 54′ S., lies about 5 or 6 miles off the coast. Owing to the weather or south-easterly set, the *Southern Cross* experienced some difficulty in clearing its N.W. extreme, which does not always break. Apparently there is a good channel between the shoal and the land, but it was not examined.

From the North point of Alite Bay to Cape Ritters the coast trends N.W. ½ N. about 15 miles, having from the offing much the same appearance as that of the land to the S.E. *Cape Ritters*, in lat. 8° 44′ S., long. 160° 37′ E., forms the outer point of the low lying land, the coast running to the N.E. for 2 miles to *Point Taylor*, the western point of Coleridge Bay.

Coleridge Bay is 3 miles across from Point Taylor to the N.N.E., and about 2 miles deep, smooth and sheltered with the ordinary trade wind. There are no dangers off its shores, except one small fringe reef, which is N. by W. some 5 miles from Port Taylor, and abreast a gorge in the hills. A bank was found at the head of the bay, on which vessels might anchor in 10 and 15 fathoms, a quarter of a mile from the shore. Two streams discharge into this bay; the western one was examined, and from 12 to 16 ft. was found in some parts. From its sheltered position Coleridge Bay should be a good place for an occasional anchorage, or a watering place during the S.E. trade winds; but few natives were seen, and only one or two small canoes; the slopes of the ranges to the northward are cultivated.

Cape Astrolabe.—From Coleridge Bay the coast trends about N.W. ½ N. for some 23 miles to Cape Astrolabe, the N.W. extreme of Malayta; the land is high and evenly rounded, with steeper shores than to the S.W. of Coleridge Bay. The lower slopes were partly cultivated, and some canoes were communicated with, but the natives were shy.

There is a small reef-encircled islet lying close off the northern part of Cape Astrolabe; and from here low land, with apparently a large shallow bight, stretches away to the eastward; this part of the coast appeared to be shoal near the shore. By Lieut. Tilly's observations, Cape Astrolabe would be in 8° 22′ S., and 160° 29′ E.

Of the N.E. side of Malayta we have few accounts worthy the attention of the navigator, and the imperfect chart of this part must be used with great caution. The eastern entrance of the channel supposed to insulate Maramasiki is probably in lat. 9° 25′ or 9° 30′ S. At this part are several islands sheltering *Port Adam*, of which a sketch was made by Mr. W. Hilliard, of H.M.S. *Havanna*. In both entrances to this port, with a strong sea breeze and an ebb tide, there are heavy overfalls, and these from seaward have much the appearance of breakers. Elizabeth Island is nearly under water at high spring tides. There is no fresh water, and the natives are wild and treacherous.

The bay upon the N.E. coast in lat. 8° 45′ S., long. 161° E., is about 8 to 10 miles wide from Cape Arsacides to the point forming the South limit. A large low island of a horse-shoe shape, the concave side to the S.S.W., and from the extremities of which reefs extend about half a mile, is situated nearly in the centre of the bay. Between this island and the land at the head of the bay there are several reefs and shoal patches; no anchorage was found around it except for small vessels. *Qui* and *Quahquahroo Harbours*, the former affording accommodation for 3 or 4 large vessels, lie about 3 miles westward of the above-mentioned island, and may be identified by the two small islands, Qui and Rongahseayah.

At the northern part of Malayta Island, a low thickly wooded island, fringed with coral reefs, lies about 2 miles from the shore off Cape Simson, and several small islets were seen near the mainland to the south-eastward.—*Lieut. Elton*, H.M.S. *Diamond*, 1882.

GUADALCANAR ISLAND is parallel to, and to the S.W. of, Malayta, being separated from it by Indispensable Strait.

D'Entrecasteaux says that the easternmost cape of Guadalcanar is of moderate height, but the land to the West of it is very high. The *Recherche* ran to the West along the land at 2½ miles off. Some distance off the land a change in the colour of the sea shows that there is but little water, and the frigate passed a shoal, the swell on which was felt, but passed too quickly to sound.

Lieut. Tilley visited the island in the *Southern Cross*, and says:—The natives of this island are of taller stature than any they had yet seen, and are noisy and rude. Swarms of canoes came off to the ship in Marau Sound, so that a commanding breeze is necessary to work ship and shake them off when required. They were, however, always friendly, and Bishop Patteson slept on shore several times. H.M.S. *Curaçoa* anchored here in 1865, and the anchorage was named after the vessel.

MARAU SOUND, at the East end of Guadalcanar, is composed of numerous islands and coral reefs with many deep passages between them, through which the tide runs with great strength and irregularity; there are good anchorages on the western side of the sound, well sheltered in either monsoon. The hills, valleys, and islands, are all densely wooded. It was surveyed by Lieut. Bower, H.M.S. *Danae*, in 1879, and the following description is principally taken from his report.

Approaching the sound from the S.E., Marau Peak, 2,430 ft. high, is a good mark; it lies near the S.E. extreme of Guadalcanar. Barrier reefs extend off the islands and main land, which form an excellent breakwater. They are generally steep-to on the outside, with the exception of foul ground about East Island. *Taunu Shoal*, a mile eastward of South-east Island, is an extensive and dangerous coral shoal, about three-quarters of a mile in diameter; the least water on it is probably about 2 fathoms.

Malapa Island is the largest island of the group, and, when seen from the N.W., its ridge appears as a single conical peak, visible 25 miles. *Pigeon Island* peak, 365 ft. high (off the West point of Malapa), is the finger-post for both the N.E. and S.E. entrances to the sound; it may readily be recognised by several tall detached trees on its summit. *Wilson Islands* are clustered together northward of Pigeon Island, and are surrounded by a reef. The flat coral islands scattered over the S.E. part of Marau Sound, and lying off the N.W. part, are much alike, having a flat sandy base, and thick covering of high trees. *Komachu Island* is separated from Guadalcanar by a narrow passage; traders report that the general depth in this passage is from 5 to 7 fathoms, with one or two shoal spots of 2 fathoms.

Conflict Bay lies just within the S.E. entrance, and has good anchorage in 8 to 15 fathoms. It has also the advantage of fresh air, being open to the S.E. trade, though if blowing strongly the sea might be inconvenient for boats. To the northward of the bay is *Ferguson Island*, the North end of which is in lat. 9° 50′ 30″ S., long. 160° 48′ 45″ E. The reef extending from it is steep-to, and there is a narrow passage between it and the shore, with a patch of 4 fathoms at its South entrance.

Danae Bay, on the South side of Komachu, is the best and most frequented anchorage in Marau Sound; the tides are not inconveniently strong, and the holding ground is good, in 9 to 15 fathoms, dark sand. *Entrance Rock*, lying in the entrance, is dangerous; it is about 10 feet in diameter, steep-to on every side, and covered at low water. A cask, with a small pole and flag were placed on it. There is a small stone jetty inside Jetty Point, the South point, reach-into a depth of 8 fathoms. Fresh water can be obtained from a creek in the western part of the bay. At 1½ cable East of Harbour Point, the North point of the bay, with 9 fathoms between, is *Harbour Reef*, covered at high water.

Renard Bay, between Komachu Island and *Beagle Island*, which has two conspicuous hills, has bad holding ground, and the depth is uneven. *Danae*

Passage, separating Beagle from Komachu Island, is 75 yards wide and has a sharp turn, and is not recommended for strangers.

North-west Bay, West of Beagle Island, is apparently clear of dangers, except in the western part, where there are a couple of islands and a detached reef; there is good anchorage in it to the northward of Danae Passage, in from 12 to 15 fathoms, but as mangroves abound it is probably unhealthy.

Unless *Emerald Rocks*, lying in mid-channel within the S.E. entrance, are properly marked, no stranger should attempt the S.E. entrance of Marau Sound, without a good sun. Pigeon Island peak bearing N.W. by N. ½ N. will lead up to the entrance which can be easily made out, as the barrier reef shews plainly; a vessel can pass on either side of Emerald Rocks, but the passage to the West, leaving Emerald Rocks on the eastern, and Ferguson Island reef on the western side, is to be preferred. Keep in mid-channel between Ferguson and Pigeon Islands, to avoid the shoal spit off Fintry Point, pass Jetty Point at a distance of 1 cable, and anchor in Danae Bay conveniently clear of Entrance Rock.

A vessel can proceed into the sound and up to Danae Bay by using *Cormorant Entrance*, between East and Square Islands, and *Wodehouse Passage*, passing on either side of Pigeon Island. The chief dangers to avoid in this route are a 2-fathoms spit lying S.E. ½ S., 7 cables from East Island, and another extending 3 cables W. by S. from Square Island; the remaining reefs show clearly. *Emu Entrance*, to the southward of Square Island, should not be used until it has been further examined.

North-east Entrance is the safest and best entrance to Marau Sound; the chief dangers to avoid are *Beaver Shoals*, two dangerous shoals, lying on its West side, with from 7 ft. to 3 fathoms, coral, on them, and 20 fathoms between. The other reefs show well. Approaching from the N.W., keep Square Island well open of East Island S.E. ½ E., which clears all dangers to the northward, until Pigeon Island peak exactly in line with the East end of Somayu, S. ¼ E., comes on; then steer in on this bearing until East Island is shut out by Malapa Island S.E. by E. ⅓ E., when the vessel will be to the southward of Beaver Shoals, and a S.S.W. course can be steered for Harbour Hill, of Komachu Island, keeping the Beagle Island coast aboard (which can be approached to a cable's length) until abreast of Renard Bay, when steer for the N.W. end of Pigeon Island, which should be passed at a distance of about a cable to avoid Harbour Reef. Pass Jetty Point at a distance of one cable, and anchor as convenient in Danae Bay.

Wolverene Channel.—The reefs of North and Round Islets are steep-to and may be approached boldly; but the neighbourhood of Reid Island should be avoided on account of its sunken dangers. Purvis Point reef shows plainly and should be kept close on board if using Wolverene Channel (which cannot be recommended), until past the dangerous Beaver Shoals.

The Tides of Marau Sound are strong and irregular. It is high water, on

full and change, at about 9^h or 10^h p.m.; one tide in 24 hours, springs rise 3 feet 6 in. The stream runs through the deep passages at from 1 to 4 knots, sometimes retaining the same direction for days together. Traders state that the water is generally higher in the N.W. monsoon, consequently the reefs being more covered are more difficult to see at that season.

Cape Henslow was named by Lieutenant Shortland, in the *Alexander*, in 1788, and is the southernmost point of Guadalcanar; it is placed by D'Entrecasteaux in lat. 9° 59′, long. 160° 39′, and Captain Denham, 1854, in lat. 9° 58′ 42″ S., long. 160° 34′ 53″ E.

The whole of the South coast of Guadalcanar is mountainous, and is so high that its summits are almost constantly enveloped in mists, so that the climate must be very wet. *Mount Lammas*, lat. 9° 45′ S., long. 160° E., was thus indistinctly seen and named by Lieut. Shortland, but was ascertained to be 8,005 ft. high by Capt. Denham. *Lion's Head*, about 5,500 ft. high, is a broad-topped, steep-sided mountain, standing out in the central part of the island.

Cape Hunter is in lat. 9° 49′ 13″ S., long. 159° 47′ 17″ E. (Denham). The coast here is covered with trees from the shore to the summit of the mountains; some small rocks terminate the most projecting headlands. *Hunter Roadstead* lies off Veuvu village, half a mile North of Cape Hunter. Anchor in 12 fathoms, half a mile West of the village, and beware of on-shore winds. *Aowawa Roadstead*, in 9° 44′ 40″ S., 159° 42′ 24″ E., was surveyed by Captain Denham in 1854. The anchorage is in 20 fathoms, half a mile W.N.W. from Aowawa Point, and in the middle of the bay. Two islets, 72 ft. high, lie half a mile eastward of Aowawa Point. *Wanderer Bay* was also surveyed by Captain Denham. Its head is in lat. 9° 41′ 47″ S., long. 159° 39′ 34″ E. It is a mile broad, and nearly a mile deep. *Serapin Islet*, lying off its North point, which is 487 ft. high, marks the entrance. *Denham Roadstead* is the best anchorage, in 6 fathoms, off a stream which enters the head of the bay. *Cape Beaufort* is in lat. 9° 39′ S., and here the coast trends in to the eastward. A reef lies off it. At 11 miles N.W. of it is a remarkable wooded island, in lat. 9° 31′ 33″ S., long. 159° 31′ 39″ E.

Cape Esperance, so named by D'Urville, is in lat. 9° 13′ 30″ S., long. 159° 41′ E. The coast between it and the remarkable wooded islet is bounded by extensive reefs.

There is a clear channel inside the reefs at about 1 mile off shore. All the reefs show, and can be easily avoided. From the N.W. point of the island, the reefs, on which the sea only breaks during heavy weather, are said to extend 12 miles to the westward, but probably not more than 5 miles.

Within the reefs, about 5 miles south-westward of Cape Esperance, is *Coughlan Harbour*, examined by Lieut. Bower, H.M.S. *Sandfly*, 1880. It is formed by two detached patches of reef to the northward, and there is anchorage in 6 to 8 fathoms, $2\frac{1}{2}$ cables N.N.W. of Dead Tree Point, which lies approximately in lat. 9° 16′ S., long. 159° $35\frac{3}{4}$′ E.

The N.E. coast of this extensive island is still little known. On its North side, and near to a river, called by Mendaña *Galego*, is the *Port de la Cruz;* and 2 leagues beyond it, to the S.E., is a second river, named by him the *Ortega.*

Langa Channel is the name given to the passage along the North coast of Guadalcanar, between a bushy islet, Rua Sura Islands, and foul ground, on the one hand, and the coast of Guadalcanar on the other hand. To use this passage follow the North coast of Guadalcanar, at a distance of 1 to 3 miles until Rua Sura Islands are sighted, the South extreme of which can then be steered for on an E. by S. ½ S. bearing. Pass about three-quarters of a mile to the southward of Rua Sura, after which there are no off-lying dangers to the eastward.

Langa is one of the best anchorages for large ships in the S.E. monsoon between Cape Espérance and Marau Sound; a mud spit, formed by a rivulet, runs off the point, a mile East of Langa village. H.M.S. *Danae*, 1879, anchored 3 cables off shore, with the trading huts S.S.E., in 10 fathoms, mud. She also anchored 2 miles East of *Tesemboko* in 11 fathoms, mud, a quarter of a mile off shore; there is similar anchorage anywhere along the coast between Gera Island and long. 160° E. The natives of Tesemboko appeared eager to trade, coming off in their canoes.

A small sandy islet, with bushes, marks the western end of Langa Channel, and a shoal, which occasionally breaks lies 3 miles E.S.E. of the islet. Foul ground was observed between the islet just described, and *Sesarga Islands*, two small islands 80 and 90 ft. high, about 5 miles to the N.N.W. Vessels should avoid this neighbourhood as much as possible.

Rua Sura Islands are two small thickly wooded islands, 80 to 100 ft. high, extending about 2 miles East and West, with a sand islet 30 ft. high off the West end. They are steep-to on their southern side, with foul ground and reefs to North and N.W. of them. Lieut. Oldham, H.M.S. *Lark*, surveyed them in 1882, and found an anchorage in about 15 fathoms, 2 cables northward of the West end of the large island, sheltered by detached reefs. *Nura Island*, about 10 miles eastward of Rua Sura Islands, is from 30 to 40 ft. high, covered with trees, and has an encircling reef half a mile from the shore.

Savo Island lies about 8 or 9 miles to the N.N.E. of the N.W. part of Guadalcanar; it is about 3 miles in diameter, and 1,800 ft. high, with an irregular and jagged outline, and appeared to be bold-to all round, with the exception of a sunken rock off the S.W. point. The North face is an uninterrupted steep white beach, apparently bold-to. From observations taken in the offing, the N.E. extreme of Savo Island is in lat. 9° 7′ S., long. 159° 48½′ E. The inhabitants are numerous and energetic, much given to barter. It is frequented occasionally by small Sydney traders who have anchored off the N.W. part. The natives appear to be living peaceably here, under recognised chiefs. Their canoes are some of the finest and most seaworthy that have been seen, and they paddle off long distances to trade with passing vessels, bringing

off pigs, yams, cocoa-nuts, bananas, maize, melons, and quantities of large eggs. There is frequent communication between this island and Florida, and Guadalcanar. The currents here are uncertain, but generally setting to the S.W.; in December it was observed to be setting to the N.E., $1\frac{3}{4}$ mile an hour.

The best anchorage is on the N.W. side of the island, about 60 yards from a conspicuous stone on the beach, taking care, as the patch is small, to have enough cable out to prevent dragging off into deep water suddenly.

Between the northern ends of Guadalcanar and Malayta there is a chain of islands, discovered by Ortega, and which have been the subject of much discussion. They are called by him *Sesarga*, *Florida*, *Buena Vista*, and *Galera*. They were seen but imperfectly by D'Urville, Nov. 17th, 1838.

Anuda or Florida Island.—Florida and Buena Vista Islands extend about 33 miles in length E.S.E. and W.N.W. Florida Island, when seen from the eastward, presents a succession of more or less open ridges; Buena Vista runs up high in the centre, but the intermediate islets are low. The East end of Florida Island was found to be in lat. 9° $9\frac{1}{2}'$ S., long. 160° 25′ E.

At the distance of about 2 miles from the shore there appears to be clear water, but near the coast about the East end are two remarkable rocks called the *Asses Ears*, and numerous patches, on which, however, nothing less than 4 fathoms has yet been found. Communication has been effected with the natives of a village on the North side of the East point; canoes came off carrying from two to twenty men, all of whom were well behaved; but little is known of them, although lads have been taken from the island on board the *Southern Cross*. The crew of the *Dancing Wave*, after having engaged labourers at this island, were murdered, with the exception of one man, on April 22nd, 1876. In November, 1880, Lieut. Bower, of H.M.S. *Danae*, with four seamen, were murdered at Mandoliana Island, while detached from their ship surveying the South coast of Florida.

There is frequent communication between the natives of Florida and the adjacent part of Guadalcanar, but in the passage between them there is much foul ground, which the eddies and tide-rips render difficult to distinguish. The flood stream was found setting to the westward hereabout. A patch of $3\frac{3}{4}$ fathoms, with apparently less water, has been reported to lie 7 miles S.E. by E. from the East end of Florida Island.

In 1865 H.M.S. *Rosario* visited the island, and anchored in the Gulf of Mboli, which was named *Port Wiseman*, after her commander. Mr. Brenchley says the island does not exceed 2,000 ft. in height. A creek at the head of Port Wiseman was found to connect with a large and superior harbour, Port Purvis, on the other side of the island, thus dividing Florida into two separate islands.

H.M.S. *Dido* passed over a coral patch about 2 miles off the entrance to Mboli Harbour, the least water found being $3\frac{1}{2}$ fathoms. The patch is nearly

round, about 2 cables in extent. From it East Islet bore S. 65° E.; Tree Islet, S. 22° W.; Sail Rock, N. 71° W.

Between the East point of Mboli Harbour and the East point of Florida, are several islets and shoals. *East Islet*, 60 ft. high, and covered with trees, has a reef extending from its South side, but its North side can be passed at half a mile distant. Discoloured water has also been seen off East Point. *Asses Ears Rocks* are 30 and 40 ft. high, and a breaking reef extends about a quarter of a mile from them. About half a mile West of them is a remarkable conical hill, 400 ft. high, with a tree on its summit.

At about half a cable S.S.E. of Flat-top Rock, off *Gaieta* village, on the S.E. side of Florida Island, is a coral patch not easily seen, upon which 3 fathoms least water was found. A larger shoal, upon which $3\frac{3}{4}$ fathoms least water was found, lies about a quarter of a mile West of Flat-top Rock. H.M.S. *Diamond* found temporary anchorage, the day being calm, in 17 fathoms, coral and sand, in a small bay westward of Flat-top Rock.

Barranago Harbour.—This anchorage, only fit for small craft, cannot be considered a desirable one under any circumstances, and offers no shelter from westerly winds. A rock awash, lies E. by S. $\frac{1}{2}$ S., nearly $1\frac{1}{2}$ mile from the South of Barranago Island. *Barranago Island* is 230 ft. high, and thickly wooded, with a thumb-shaped islet off its western end. *Barranago Peak*, on the S.E. side of the harbour, is sharp, 680 ft. high, and remarkable on account of its slopes being open and partially bare of trees.

Port Purvis is a large well protected harbour on the S.W. side of Florida Island. The general depth of the port is too great for anchoring, but, at its head, S.E. of Quoin Hill, good anchorage will be found in 10 to 15 fathoms, mud. Table Rock, always covered, is the only detached danger in the port, and lies about $1\frac{1}{2}$ cable off the western shore. Savo peak kept astern bearing West, will lead up to Barranago Island; give South head a berth of 2 cables to avoid the spit running off it, and keep mid-channel up to the anchorage.

Utaka Passage, joining Port Purvis and Mboli Harbour, is much used by small craft. H.M. ships *Renard* and *Miranda* have passed through it. It appeared to be clear of dangers, with 10 fathoms in mid-channel and 4 and 5 fathoms close to the mangroves on either side; the least water found was 16 ft. on a small shoal in the centre, at about 1 mile from the northern entrance. The passage is about 4 miles long, and from a quarter to half a mile wide, with two sharp turns near the northern end. The tidal stream was found to be running strongly.

H.M.S. *Diamond* moored, head and stern, in 17 fathoms, mud, off the village of Nago, in a small harbour, the approach to which is narrow but deep, near the middle of the South shore of *Sandfly Passage*, which divides Florida from the next island to the N.W. To find this obscure anchorage, when entering Sandfly Passage from the S.W., keep mid-channel until a well-defined conical hill, with a rounded knoll seaward of it, is seen to form the N.E. boundary

of a comparatively deep bay. Enter with the conical hill upon the port hand, pass between some coral reefs and patches, proceed to the extreme head of the bay, and anchor.—*Lieut. Elton*, 1882.

Buena Vista, 1,050 ft. high, is in lat. 8° 53′ 30″ S., long. 159° 59′ 30″. Between this and Cape Prieto, the S.E. extreme of Ysabel Island, is *Ruadika* or *Solitary Island*, an isolated rock, 30 ft. high, black and perpendicular, and its summit surmounted by two trees. It lies S. by E. ¼ E. 10 or 11 miles from Cape Prieto, and N.W. by W. about 15 miles from Buena Vista, and is probably surrounded by a bank, with 25 to 28 fathoms, but it might be only a race. It is in lat. 8° 43′ 0″, long. 159° 47′ 30″. There are strong sets in the neighbourhood, running generally to the S.W., and it should not be approached without a commanding breeze. A good look-out should also be kept at night. In December the current was observed to be setting northward 2 miles an hour.

Indispensable Strait, separating Malayta and Guadalcanar, is the bay supposed to be seen by Ortega to the eastward of the South point of Ysabel Island. It derives its name from the ship which first sailed through it under Capt. Wilkinson, in 1790.

The weather in Indispensable Strait at the season of the S.E. trade may be called uncertain. Heavy squalls of wind and rain frequently pass over, with at night time intense darkness, and the wind shifting about several points so frequently as to make it trying to keep the sails trimmed, or to know which tack to keep on. The water is generally smooth, and a westerly set may be expected.—*Lieut. Tilly.*

Ramos Island, surrounded by a reef, is stated to lie about 15 miles West of Cape Astrolabe, shoal ground being reported to exist in the channel between. The German vessel *Ariadne*, 1879, passed over a bank of 11 fathoms at 6 miles West of the island. To the northward of this are four small islands situated on a bank of soundings of 10 to 12 fathoms.

Inattendue, or *Gower Island*, lies to the northward of Cape Astrolabe. The first of these names is due to its discoverer, Surville, in 1761; the second to Carteret, 1767. Capt. Hogan says:—"Gower's Island is about 4 miles in a North and South direction, and 2 miles East and West; it is low and level, covered with trees, and nothing remarkable on or about it that I could see, further than one tree with a bushy top, which appears a little higher than the rest, in the middle of it." It is little known, but appears to be much larger than described by Capt. Hogan. It is placed on the chart in lat. 7° 46 S., long. 160° 30′ E.

Russell or Puvulin Islands.—This group, between Guadalcanar and New Georgia, and extending 20 miles East and West and 12 miles North and South, consists of two principal islands and a number of small islets scattered around them, having, as a rule, deep water close to. The largest island is elevated 1,600 ft., and there is a deep channel between it and the island eastward of it.

The northern part of the group is bordered by a barrier reef, having numerous small islets from 10 to 50 ft. high upon it, nearly all of which are covered with vegetation. In the centre of the barrier reef there is a deep passage between the islets It-a-matic and Ellavaline, the latter being recognised by a tufted bush upon its centre. Inside the barrier there are several coral patches, some of considerable extent.

H.M.S. *Renard* anchored in 15 fathoms in a confined position for a small vessel, at the entrance to Renard Sound, and obtained good fresh water from a stream 1¼ mile up the sound. Trading vessels usually anchor off Moco Island, or in the bight S.E. of No-no Island. In the inlet running to the S.E., at the head of West Bay, there is anchorage for a large ship with room to swing. In passing through the central channel of these islands, anchorage was found by H.M.S. *Diamond*, 1882, in a small inlet, about mid-way, upon the eastern shore, in 20 fathoms, mud and coral, with just room to swing.

The group appeared to be thinly inhabited by a peaceable and keen trading people; most of whom speak a little English, and are well provided with European goods. Pigs, yams, pine-apples, &c., can be obtained.

Mr. Brodie, master of the schooner *Lavinia*, 1873, reported a *shoal*, on which the sea breaks only in heavy weather, lying with the highest peak of Cape Marsh, Russell Island, bearing N. ½ E., distant about 4 miles.

YSABEL ISLAND lies to the North of the West end of Guadalcanar. It is about 125 miles long, N.W. by W. ½ W. and S.E. by E. ½ E., and perhaps 25 miles in its maximum breadth.

Ysabel or Isabel Island, as well as others of the Solomon group, is supposed to contain valuable timber, one resembling satin-wood and another ebony. The canoes are secured together by a kind of cement from the nut of the plant Muki, and, judging from its effect on the canoes, would probably be adapted for paying seams, &c. Firewood is generally obtainable by sending to the beach for drift wood, or else by taking a cross-cut saw on shore.

The S.E. extreme of Ysabel Island, in lat. 8° 34′ S., long. 159° 44′ E., is high, *Mount Guillard*, of 2,050 ft., rising at 2 or 3 miles N.W. of it. Between *Cape Prieto*, the eastern cape of the S.E. side of the island, and the western cape, the distance is 2½ miles.

Mahigi Islet lies 1½ mile N.N.E. of Cape Prieto, with no good channel between. Off the western cape, distant 2½ miles from Cape Prieto, is *Victoria Islet*, and some small rocks (*Lagali Rocks*) S.W. of it. About 3½ miles W.N.W. from Lagali Rocks some native villages will be noticed on the headlands. The huts are curiously constructed for defence, some of them being built in the trees, and reached by bamboo ladders.

Vulavu Anchorage lies a mile to the northward of the villages above-named, and is sheltered by a reef which breaks but does not dry. A small rock, with a little vegetation, 10 ft. high, known as *Green Rock*, marks the entrance, a narrow channel existing on either side of the rock. The anchorage is only fit

for small vessels or steamers. With S.W. or westerly winds it is unsafe. *Opii Point*, half a mile westward of Green Rock, has a reef stretching off to the S.E. *Le Hinia* or *Cockatoo Anchorage*, lies a mile westward of Opii Point; the coast is foul inshore.

St. George's Island lies to the West of the South end of Ysabel, and forms with it the *Bnie des Mille Vaisseaux* or *Thousand Ships Bay*, discovered by Ortega. The island is about 13 miles in length, and seems entirely uninhabited.

Pigeon or *Passage Island* lies nearly in the centre of the mouth of the bay, and has a reef off its South and West sides. The island was daily frequented by the sportsmen from D'Urville's ship, and they procured an ample supply of the bird whose name was applied to it. It is a small spot, embellished with a few trees, and is the real dove-cot of the neighbourhood, large flocks of them leaving here for the larger islands, and returning in the evening.

Astrolabe Harbour is directly to the West of this. It is not more than a mile in its greatest extent, but the water is so quiet, that, if necessary, a ship could heave down and careen with the greatest security. The coast is guarded by a continuous belt of reefs, awash, which extend only a few yards off. The position of the *Astrolabe*, which anchored here in November, 1838, was not more than 50 yards from the trees on shore to which she was moored, the stern of the vessel lying secured by an anchor fixed on the other side of the channel. The station of Astrolabe Harbour is in lat. 8° 31′ 0″ S., long. 159° 32½′. There is only room for one vessel, and no fresh water can be obtained.

St. George's Island is separated in the North from Ysabel by the *Ortega Channel*, scarcely 300 yards broad, its depth varying between 3½ and 4½ fathoms. The shores are clear, and excellent anchorage is found throughout it. Towards its seaward entrance the Ortega Channel terminates in a large bay formed by two islands.

The S.W. coast of Ysabel Island was not closely examined by D'Urville, who passed at 7 or 8 miles distant. It has been visited by the Melanesian mission. The natives in the vicinity of *Cockatoo Anchorage*, near the S.W. point, were very friendly, and boys have returned with Bishop Patteson for education after his visits. There is a small stream of water at the above anchorage, but inadequate to supply any large quantity; there is, however, a plentiful supply on the opposite side of Thousand Ships Bay, in the second bight in St. George's Island, where H.M.S. *Cordelia* anchored in 19 fathoms, sand and mud. The stream, which is running and good, will be found among the mangroves, about 200 yards to the left of a conspicuous opening in the bush, which looks like a watering place, but is not.

To reach Cockatoo Anchorage, having passed northward of the detached 3-fathoms shoal lying N.W. of Cockatoo Island, keep the extreme of Isabel

Island well open of Sandy Point, in order to avoid the reef extending N.W. from Cockatoo Island; when nearing the anchorage these points should be brought nearly in line.—*Lieut. Hughes*, H.M.S. *Cormorant*, 1881.

Towards the N.W. part of the South coast is *Cape Foxhull*, and then *Nairn Island*, lat. 7° 40′ S., long. 158° 23′ E.; beyond the latter is an extensive range of low islands, which occupy the greater portion of the space between the islands Ysabel and Choiseul. These islands exhibited no signs of inhabitants; neither cocoa-nut trees nor canoes were seen.

Cape Comfort (in about lat. 7° 19′, long. 158° 6′ 30″), is the northern point of Ysabel Island, and received its name from Hammond. Surville anchored in a harbour, which he named *Port Praslin*, on the N.W. end of the island; and here he had several conflicts with the natives, which caused him to quit. Farther to the S.E. we may look, according to Fleurieu, for the bay in which Mendaña's ship anchored, and which he named the *Port of Santa Ysabel de las Estrellas* on the first discovery of the islands. It lies about 60 miles S.E. of Port Praslin, and is reported as full of reefs. Some detached patches lie outside, about 5 miles from the coast, the least depth found on them being 6 fathoms.

In 1879, the master of the schooner *Renny* reported the existence of extensive reefs, parallel with the North coast of Isabel Island, the channel between them and the coast being about 10 miles wide.

Latour du Pin Reef, announced in 1864 by Capt. Favreau, about 30 miles N.W. of Ysabel Island, was said to be awash, and about 7 or 8 miles in extent. Lat. 6° 59′ S., long. 158° 52′ E.

Lass Shoal.—On October 11, 1861, Capt. Lass, of the brig *Wailua*, discovered a shoal to the N.E. of Ysabel Island, in lat. 7° 45′ S., long. 159° 54′ E. It was about half a mile wide, and extended as far as the eye could reach to N.W. and S.E. Where it was crossed 11 fathoms was found, but at about 1½ mile distant the water had a milky appearance, which it was thought would cause a vessel to strike. It was also probably seen by Capt. C. Edwards, on June 1, 1866, as the descriptions coincide. The mean of the two positions will be 7° 46′ 30″ S., long. 159° 49′ 30″ E., but it is placed 4½ miles to the westward of this on the chart. When last observed it appeared to be about half a mile in extent, with shoal water around it for a space of about 2 miles.

Buraqoi, or Murray Island, as seen from the North, resembles a truncated cone, about 1,000 ft. high; it is said to be uninhabited, but abounding in pigs. This island is sometimes visited by the natives of Russell Islands, when on their trading voyages to New Georgia. The only landing place is on a small beach on the N.W. side. Running by it some 4 or 5 miles to the North no dangers were seen; the natives also report that there are no reefs off it. It lies some 15 or 18 miles to the West of Russell Island, and E. by S. ½ S. 24 miles from Mbulo, in New Georgia. Lieut. Tilly places this island in lat. 9° 2′ S., long. 158° 34′ E. Other observations place it in lat. 9° 0′, long. 158° 40′.

NEW GEORGIA, formerly thought to be one island, is now found to consist of three large islands, besides numerous smaller ones. The northern and largest is named *Rubiana*, or *Cousagie Land;* the south-westernmost, *Rendova*, *Rendezvous*, or *Hammond Island*, to the S.E. of which is *Montgomery* or *Prince Island*. The large island is separated from the other two by *Blanche Channel*, in the eastern entrance of which lies a group of islets. We have some information relating to the S.W. coast, but the N.E. coast is almost entirely unknown.

Cape Pitt, the summit of which is generally obscured by clouds, is the S.E. extremity of New Georgia, and is in lat. 8° 50′ S., long. 158° 14′ E. (approximate).

A *coral shoal*, with only 3 fathoms water on it, lies 15 miles South of Cape Pitt, according to the master of the *Brougham* whaler. As its extent has not been determined, passing ships should give it a wide berth.—*Cheyne.*

Mbulo Island, N.E. of Cape Pitt, is about 800 ft. high, with a small saddle in the middle, apparently bold-to on its North and East sides, and uninhabited. About 1 or 2 miles East of it is the small, low island of *Kisa*, also uninhabited, and apparently bold-to. Kisa is not seen, when coming from the eastward, at any distance, owing to its being low, and also under the high land of Mbulo. These two islands are said to be used as burial grounds, and here the natives in the neighbourhood keep some of their weapons.

At the S.E. extremity of New Georgia is a conical mountain, about 2,500 ft. high. The North coast runs N.W. by N. for 14 or 15 miles, then after a bend or curve in of several miles, on again to the N.W. ½ N. This part of New Georgia has a number of small islets off it, connected more or less by reefs, and lying off the coast line of the main island some 3 to 8 miles; these islets appeared to be bold-to on the outer side.

Passing Mbulo, the small island of *Maimale* opens out, between Mbulo and the main island. At the head of the bight thus formed is the village of *Kavolavata;* then low land like an islet runs out to the northward. From this point, for 25 miles, the coast line is formed by a chain of islets. The first or south-eastern one is some 3 or 4 miles North and South, low, and called *Tingolanu*, then follow *Karajiu*, *Karajiu-geta*, *Karajiu-miki*, and *Matin*. The next, a smaller one, falls back a little to N.W. by W. By indifferent observations this islet was in lat. 8° 27′ S., long. 158° 1′ E.

From this islet the connecting reef runs about East and West for 1½ mile, with a few tufted rocks inside it, to the next islet, which looks like a double one, being almost divided near its eastern end. At its West end there is a narrow opening or passage where Sydney traders go in and anchor, to trade with the natives of *Repi* and *Marovo*, villages on the main island abreast this. The islet on the West side of the passage runs out about N.N.W. and S.S.E. for nearly half a mile. A reef runs off its S.E. end a short distance into the

passage, the eastern side of which should be kept on board. There was a set out through the passage to seaward, and it is only suitable for small vessels.

From abreast this opening the N.W. (visible) extreme of New Georgia bore N.N.W., and the peak of the range of mountains S. by E. $\frac{1}{2}$ E. The western part of the higher range was about 2,100 ft. high. The hills are of an irregular shape, one resembling a nipple.

The N.E. part of New Georgia is an evenly-rounded point, the northern extreme of which is in lat. 7° 57′ S., long. 157° 31′ E. Between Marovo Opening and the above position the coast is fringed with a barrier reef, from 1 to 3 miles distant, on the outer edge of which stand innumerable islets, between which are many passages and anchorages. No difficulty was experienced in steaming along the coast at a distance of three-quarters of a mile.

Marovo Passage is about 4 miles off the mainland, and a number of small islets are dotted about among the reefs inside. Though this part of New Georgia is nearly 160 miles from Malayta, the natives of the two places communicate, making stopping places at Russell Islands and Buraqoi. There appeared to be but few inhabitants. Their canoes were stable, and strongly built. The natives were dark, sturdy-looking men, and very active in the water, scrambling and diving in the most energetic manner. They brought off tortoise-shell and the usual ornaments, and were eager for pipes and tobacco.

On Arrowsmith's chart a reef is marked, called the *Bridgewater Shoal*, in about lat. 8° 53′ S., long. 157° 12′ E.; and 12 leagues S.W. by W. of it is an island called *Princessa*. The officers of H.M.S. *Renard*, 1881, and H.M.S. *Lark*, 1882, saw nothing of them, and no soundings could be obtained at 250 fathoms. They have therefore been expunged from the charts.

Montgomery Island, about 15 miles long, E. by S. and W. by N., is uninhabited. Some fringing reef extends from the western extremity, but the eastern end seemed steep-to. The *Renard* passed within half a mile of it. About 10 miles eastward of Montgomery Island is *East Island*, with foul ground apparently extending for some distance eastward of it. H.M.S. *Beagle* passed over two shoals, extending parallel to each other for about three-quarters of a mile W.S.W. and E.N.E., from 4 to 5 miles South of East Island. The least water obtained was 5 fathoms, coral bottom; but it was considered that shoaler water existed.

Rendova Island, of coral formation, and densely wooded to the water's edge, is 18 miles long, North and South, and 8 miles broad. The East coast is steep-to; no bottom at 20 fathoms could be obtained close to the shore in most places, including the three small thickly-wooded islands lying off the centre part of the eastern shore. *Renard Cove*, westward of the western or Observatory Island, is stated to be a small and apparently secure anchorage. From the eastern side of the cove a reef extends 200 yards, and runs parallel to the shore, partly drying at low water, and having two or three large stones upon it that are always uncovered. H.M.S. *Renard* was unable to work up into shoaler water at the

head of the cove, where there is 15 fathoms at less than half a cable from the shore, in consequence of light winds, and an outset from the lagoons at its head; she anchored in 42 fathoms, black mud, in the centre of the cove. A depth of 21 fathoms was found in *Blanche Cove*, which is exposed to the eastward, and there is room only for a small vessel to anchor.

From Cape Richards, the N.E. point of Rendova, the coast trends N.N.W., and is broken by many small creeks and inlets. At $2\frac{3}{4}$ miles northward of the cape is *Tippinge Creek*, formed by a small coral islet; it may be recognised by the cocoa-nut trees and some conspicuous dead trees beyond them upon the main land. The creek is small, but secure from all winds except those from the North, and affords anchorage in 15 fathoms, black sand. Good water can be obtained from a stream near the cocoa-nut trees, and fish are abundant in the creek.

From *Cape Pleasant*, the S.E. extreme of Rendova Island, the western of the New Georgia Islands, a reef extends 3 cables, upon which the sea breaks heavily. From thence the coast trends about 7 miles westward to *Bluff Point*. Having rounded this point, the coast recedes, forming *Banyetta Bay*, about 1 mile deep, in the N.E. corner of which lies the town of Banyetta. This bay is open to the westward, and the water appears too deep for anchorage as far in as the shore reef.

Between Cape Pleasant and Banyetta Point, in lat. 8° 34′ S., long. 157° 7′ E. (approximate), the fringe reef does not extend more than 50 yards from the shore, and generally not more than 20 yards, with apparently no outlying dangers. From Banyetta Point to Rendova Harbour the coast trends N.E. by N. about 13 miles; a barrier reef extends from the western islet in the harbour, and many dangers exist from 1 to 2 miles off this part of the coast, which vessels should pass outside of. H.M.S. *Barracouta*, in 1876, anchored in a cove about 5 miles south-westward of Rendova Harbour, but it is small, and cannot be recommended.

After rounding Banyetta Point a number of low islands open out to the eastward, having passages between them and the land of New Georgia; and the peak of Koulangbangra, about 5,000 ft. high, will be seen to the northward, about 28 miles distant. Proceeding to the northward, *Rendova Mountain*, about 2,500 ft. high, which is close to Rendova Harbour, and resembles the peak of Koulangbangra, will be seen to the S.E.

Rendova Harbour.—On the N.E. side of Rendova there are three small islands, named Hammond or Markham Islands. Between these islands and Rendova H.M.S. *Blanche*, in 1872, found an anchorage in Rendova Bay, giving the position of the West side of the eastern island as lat. 8° 23′ 23″ S., long. 157° 15′ 25″ E. The entrance, nearly a cable wide, is between the central and eastern islands. This harbour is the only one in the locality adapted to vessels of considerable size, but must be used with caution, in consequence of the many shoals which exist in it.

About 5 miles W. by N. from Renard entrance to Rendova Harbour is the entrance to *Moonda Harbour*, across which there is a bar of 12 ft. at high water, between two small islets, with heavy breakers with southerly winds. The passage to the eastward into the harbour after the bar is crossed is intricate, full of shoals, and should not be attempted by a stranger unless in a steam-vessel. There is good anchorage, the depth varying from 3 fathoms (on the patches) to 14 fathoms. Water can be obtained at Moonda, about 1 mile from the anchorage. Large vessels should anchor in Rendova Bay.

In leaving Moonda to pass through Ferguson Passage, after rounding the South end of Wanna Wanna, keep along the fringing shore reef, for about 6 miles, when it gradually trends to the westward, with a small islet on its South edge, about 1 mile from which is the passage.

Rubiana Island lies about 3 miles to the northward of Rendova Bay. Its inhabitants are said to be the most warlike of the Solomon group; they are utterly insensible to kindness, and great caution is necessary when dealing with them. A small quantity of provisions and water may be obtained.

Wana Wana Island is an extensive low and densely-wooded island, forming the West side of Hathorn Sound, on the West side of New Georgia. It is apparently divided in two by a channel. The East and N.E. edge of this island has a fringe reef, studded with small wooded islets, lying from 1 to 2 cables from the main island. Off the West and N.W. part, detached islands and small groups of islets are scattered to a distance of 4 miles, interspersed with many reefs and sandbanks. On its East side is *Round Hill*, 250 ft. high, a good mark.

Hathorn Sound is much used by vessels trading to Rubiana; the general depth of the sound is too great for anchoring, but anchorage will be found at its head in 17 fathoms with Pinnace Island bearing East, distant 2 cables. Steer a mid-channel course until abreast of Deep Point, when borrow over towards Wana Wana, to avoid the reef projecting off Cutter Point; keep within 2 cables of the barrier reef off Wana Wana until Pinnace Island bears East; drop the anchor midway between the Wana Wana Island reef and Pinnace Island, avoiding a sunken rock lying 1½ cable W.N.W. of Pinnace Island.

The tides run with considerable strength through the Gutter to Rubiana, following the eastern side of Hathorn Sound by Pinnace and Gutter Islands, but a vessel anchored as above would be out of the strong tideway. *Gutter to Rubiana* is deep and narrow, with several sunken rocks at the southern part, and cannot be recommended to strangers.

Coolambangra, or *Koulangbangra*, is 16 miles long, North and South, by 13 miles broad, and has two lofty peaks, of about 5,000 ft. high, the southern of which has a flat level top. *Square Top Peak*, being of less height (1,600 ft.), is not so often enveloped in clouds, and is consequently a better mark. The natives assert the existence of a salt-water lake, abounding with fish, on the summit of the island. The S.W. part of Coolambangra, near Blackett Strait,

is much broken. A small islet, 15 ft. high, lies one-third of a mile off the S.E. part of Coolambangra, and at the eastern entrance to Blackett Strait. *Blackett Strait*, about half a mile wide in the narrowest part, forms a deep clear channel between Coolambangra and Wana Wana Islands.

Ariel Cove, on the West coast of Coolambangra, is about three-quarters of a mile deep, N.N.E. and S.S.W., and has a narrow entrance, about 80 yards across between two reefs which extend from either shore, opening out inside to a breadth of half a mile. No natives were seen during the visit of H.M.S. *Beagle* in 1878. Good water can be obtained in small boats from a stream at the head of the cove. Eddystone or Simbo Island, a little open to the southward of the first large island East of Keso, will point out the position of the cove.

Guizo, Keso, or Shark Island, 300 to 400 ft. high, is low compared with the large neighbouring islands. It has a fringe of reefs and small islands, lying from a half to 2 miles off its northern side, with some intricate passages inside them known only to traders. A stranger proceeding to Guizo anchorage should approach from the southward, and not risk his vessel among the reefs. Foul ground extends for a considerable distance to the westward of Guizo, and should be given a good berth when proceeding through Guizo Strait.

The harbour is situated inside the coral reef at the East end of Keso island; the entrance is about half a mile broad, and is easily distinguished from the mast-head of a vessel approaching from the southward, as the sea breaks heavily on either side. In the middle of the harbour lies a 2-fathoms coral patch, which is easily seen. The best anchorage is in 14 or 15 fathoms off the village. No water can be obtained on the island.

The approximate position of the Observation Spot, on the East end of Keso Island, is lat. 8° 5′ 40″ S., long. 156° 50′ E., according to the survey by Lieut. Rendell, 1875. It is high water in Keso Harbour at midnight during the S.E. monsoon, and at noon during the N.W. monsoon. There is only one tide in 24 hours; the rise is about 6 ft.

Two routes are available from Keso to Koulangbangra; the northern is through an opening about 100 yards broad, with 10 fathoms in it, in the northern reef, about 1½ mile to the eastward of Keso Island; the southern, or *Ferguson Passage*, is, after passing through the opening or entrance to Keso Harbour, to steer to the eastward along the reefs until the peak of Koulangbangra bears about N.E. by N., thence there is a clear passage 1 mile broad through both reefs. The islands on the northern reef are generally barren, while those on the southern have trees growing to the water's edge.

Ferguson Passage, between the Guizo Islets and the Wana Wana Islets, is difficult to discern; however, a guide by which it may be recognised is that the Guizo Islets are about 40 or 50 ft. higher than the Wana Wana Islets. There is a reef on each side of it.

Wilson Strait, about 4 miles wide, separates Vella Lavella Island from

Ronongo Island, and being open to the S.E., strong currents and a cross tumbling sea set through it. *Reef Island* lies 3½ miles N.N.W. of the N.W. point of Ronongo, and almost in the centre of Wilson Strait; a reef extends 1¼ mile West of it, and a quarter of a mile East of it.

Vella Lavella Island is 23 miles long, N. by W. and S. by E., with a large bight on its western side, in which lie *Renard* and *Bagga Islands*. Vella Lavella is mountainous, with many peaks from 1,000 to 3,000 ft. in height, but none are very conspicuous.

Ronongo Island, 13 miles long N.W. by N. and S.E. by S., has a ridge highest in the northern part, where it attains an elevation of about 2,000 ft.

Simbo, Narovo, or the Eddystone.—The rock lying about 10 miles S.S E. of Cape Satisfaction, the southern point of Ronongo, which Shortland calls the *Eddystone* (1,100 ft. high), is, according to the observations of D'Entrecasteaux, in lat. 8° 18′ S., long. 156° 30′ 40″ E., which is almost identical with that given in the survey by Lieut. Oldham, H.M.S. *Lark*, 1882; the latter makes the observation spot on the West side of the reef sheltering the harbour to be in lat. 8° 16′ 1″ S., long. 156° 29′ 33″ E. It is about 4 miles in length N. by E. and S. by W., and very irregular in shape.

"The North end is low, but its S.W. point is very rocky and mountainous; the southern shore is also high and inacessible. A small, low island lies close to its S.E. side, to which it is connected by a shallow bar at each end of the passage formed between them, in which there is deep water.

"The Eddystone is possessed of a small harbour on its N.W. side, formed by reefs to seaward; at the South part or head is a snug cove, with 8 or 9 fathoms water, in which two or three ordinary sized vessels could moor to the trees, and be in perfect safety from all winds. There are two passages leading to this little harbour. The widest, about 1½ or 2 cables, with deep water throughout, is between the South end of the outlying reef and the high cliffy shore. The other is a very narrow opening in the reef on the North part, to the westward of a small islet situated on the reef, by which it is connected to the shore.

"The island is of volcanic formation. On its S.W. part a considerable quantity of sulphur might be collected about halfway up the hill. The ground is quite hot in its vicinity, and steam issues through the fissures of the rocks in some places. The Eddystone is well wooded, but the soil is indifferent. No fresh water for shipping, nor supplies, except cocoa-nuts."—*Cheyne.*

"Eddystone Island, when seen from a distance of about 20 miles, has the appearance of four islands; towards its southern end there is a peculiar knob with three nipples. There is a good harbour on the West side of this island, with a sufficient depth in the middle for vessels of moderate size. The entrance lies between a low outlying reef, which is slightly vegetated, and the island. A patch lies in mid-channel, at the entrance of the inner anchorage. After the entrance to the harbour is made out, steer along the coast at a cable from the

beach, taking care to give the point that forms the inner anchorage a little wider berth, then steer into the harbour.

"There is a salt-water lake about 15 ft. above the level of the sea, in which there was a large number of ducks. In some parts the water of this lake is almost boiling, owing to subterranean fire. *Water* may be obtained at a small rivulet, which is perhaps dry during the hot season."—*Commodore Goodenough.*

A patch of 6 ft. lies N.W. of the southern point of the harbour, and about 4 cables off the West side of the southern part of the island are some rocks 30 ft. high, with a sunken rock a cable N.N.W. of them, lying on a bank of 5 to 6 fathoms. At 1 and 2 miles S. by E. of the South point are two banks, the least depth on each being respectively 5 and 7 fathoms.

The natives are of the black race, with frizzled hair, and, unlike their neighbours, are on friendly terms with Europeans. Therefore, vessels visiting the Solomon group should get pilots and interpreters here, as they are well acquainted with the islands.

Manning Strait, the passage separating Ysabel and Choiseul Islands, was traversed by Manning in 1792, and also by D'Urville in 1838; the latter states that the tide-races in it were so strong as to resemble the sound of breakers close-to. Capt. Manning recommends strangers to send a boat ahead, in order to examine it in passing through.

The depth in the West passage, between Cape Labée and the Arnavon Islands, judging by the appearance of the water, which is clear, is probably not less than 7 fathoms. A shoal of about 5 fathoms exists S. by E., 6½ miles from Cape Labée, and another shoal lies S.E. by S. ½ S., 7 miles from Cape Labée, at the western extreme of which there is about 9 fathoms; this shoal trends to the E.N.E., in which direction there is probably shoaler water. H.M.S. *Danae*, 1879, rounded Cape Labée at a distance of 1½ mile, in from 9 to 15 fathoms, and stood to the southward, passing between the two shoals above named, with Cape Labée bearing N.W. by N. ¾ N.

CHOISEUL ISLAND was thus named by Bougainville, and it was also passed by Shortland in 1788. *First Point*, its eastern point, was called *Ile de Première Vue* by Surville, who saw it in the *St. Jean Baptiste*, in 1769. It is only an elevated summit, which stands on the East point, and, being connected by low land, at a distance appears like an island. A little to the North of this D'Urville passed, as it is supposed, over a bank of 5½ to 7 fathoms, but this requires verification. *Towra Peak*, 1,800 ft. high, just within First Cape, is a good mark; its position is lat. 7° 20′ S., long. 157° 30′ E. (approx.).

From the East end of Choiseul Island an archipelago of low wooded islands runs in a tongue, 3 to 7 miles wide, in an E. by S. direction, for 20 miles. The eastern extremity of these islands was called *Cape Labée* (lat. 7° 28′ S., long. 157° 53′ E.) by Admiral Krusenstern, after one of the officers on board

Surville's ship; and westward of it is a round haycock-shaped hill, about 250 ft. high, called by Surville *Gros Morne*. Krusenstern supposed it to form the S.E. extremity of Choiseul Island. Three remarkable rocks, about 80 ft. high, lie to the northward of this haycock, rising nearly perpendicularly from the water.

The N.E. sides of Choiseul Island are very high, mountainous, and steep; the coast falls with rapid descent to the sea. Some indications of inhabitants were seen, but evidently very few. Towards the North, and near to Cape Alexander, the North point, the low land seems to extend to a greater distance, forming plains of considerable extent. *Cape Alexander*, lat. 6° 37′, long. 156° 27′, is formed by very low land, apparently quite capable of cultivation. A cape to the eastward of Cape Alexander was named by Captain Hogan, in 1796, after his ship *Cape Cornwallis*, which he took for the former cape, but his positions do not agree. *Kangopassa* village, where the massacre of the crew of the *Zephyr* took place in 1880, is situated between two small islands on the North side of Choiseul Island in lat. 6° 40′ S., long. 156° 33′ E. Good anchorage apparently exists in the lagoon formed by the outer reefs.

Of the S.W. side of the island our knowledge is very imperfect. Near the N.W. extremity, a portion that Bougainville examined more closely, he places a bank parallel with the coast, on which there is 5 and 6 fathoms, coral bottom, which, turning at an angle in its southern part, extended across, for a large portion of the breadth, the Strait of Bougainville. This does not exist as a bank, being only overfalls from the very strong current running S.E. breaking as if over rocks awash. H.M.S. *Dido*, in 1874, observed the whole of the N.W. coast of Choiseul Island to be fringed by a reef to 5 or 6 miles off.

Captain Cheyne says that the whole line of coast, from Cape Alexander to the North side of Choiseul Bay, was fronted with dangerous shoals and coral patches, and that a vessel bound through Bougainville Strait should not approach nearer to that coast than 5 miles until it is better examined. This confirms the descriptions of Bougainville, as given below, and will caution the navigator in passing through it.

Warriors River (*Rivière des Guerriers*) was examined by Bougainville's boats, but the coast is nearly unapproachable, the sea beating full on it, and the mountains coming down nearly to the coast. The land is almost entirely covered with wood; but few huts or people were seen.

Choiseul Bay lies to the North of this, but Bougainville did not enter with his ships, on account of the hostile character of the people, who came in about ten canoes out of the above river to attack his boats. The peninsula which forms the North side of the bay was entirely covered with cocoa-nut trees. The South entrance to this bay is narrowed to about a cable by the reefs on either hand. The whole of the bay to the northward of the centre islet is thickly studded with shoals. There is a deep water channel—apparently the only one—between the third and fourth islets. The centre islet should be passed on its West side. A spur-shaped reef extends S.W. from the islet,

but apparently has plenty of water at a cable's distance. H.M.S. *Emerald* anchored in 12 fathoms, coral sand, with the left extreme of the first or southernmost islet bearing S. by W. $\frac{7}{8}$ W., and the islet in the centre of the bay N. 2° E.

The South coast of Choiseul, between Choiseul Bay and Bambatani, has reefs extending off it for a distance of about 10 miles. *Bambatani*, in lat. 7° 7′ S., long. 156° 40′ E., consists of three villages close together in one bay; the king spoke a little English, and was friendly. Anchorage was found at the West end of the bay in 12 fathoms, coral sand, with Shortland Island bearing W. by N., and the peak of Vella Lavella about South.

Patches of foul ground, some of which were awash, were observed from the *Emerald*, at from 3 to 6 miles southward of the coast from abreast Bambatani eastward. A coral reef of considerable extent was observed 10 miles distant from the shore, near Bambatani. A passage, apparently clear, exists 2 to 3 miles from the coast, from long. 157° E. as far as Bambatani. One shoal spot was seen in this passage, which can be passed on either hand.

Bougainville Strait, thus named from the navigator who first passed through it in 1768, separates Choiseul Island from Bougainville Island, the next to the northward. Lieutenant Shortland sailed through twenty years later, and gave the name of *Treasury Islands* to the numerous islands which lie in the strait. The charts are not good hereabout. Capt. Fradin, in the French ship *St. Michel*, in November, 1861, made the N.W. islet to be in lat. 6° 55′ S., long. 155° 18′. There is a wide and fine bay to the N.N.W. of it. There is one island which is tolerably large, the East extremity of which he named *Point Danger*, because it was surrounded with rocks; the S.E. point is named *Cape Stephens;* Krusenstern called this *Shortland Island*. To the North of this is a large number of islands, which occupy all the space between it and *Cape Friendship*. About 6 miles westward of Shortland Island (Soondah) is *Ahloo Island*, the king of which is said to be friendly by the traders.

Treasury Island.—H.M.S. *Blanche*, in 1872, anchored in a spacious and excellent harbour on the South side of Treasury Island, between it and a group of rather high and densely wooded coral islands. The best entrance is from the westward. There is an excellent stream of fresh water at the western point of the bay. This harbour has been named *Blanche Harbour*, and the group of islands *Stirling Islands*. Treasury Island is a high basaltic island. The harbour, which used formerly to be a resort for whalers, is now disused by them on account of the treacherous habits of the natives. Traders call off the North coast of the island, but never anchor. In January, 1884, it was reported that a British naval depôt had been formed here.

The central part of Treasury Island was found by Captain von Schleinitz of the German war vessel *Gazelle*, 1876, to be situated in lat. 7° 20′ S., long. 155° 26′ E., or several miles N.E. of what had hitherto been supposed to be its position. The island is from 650 to 1,000 ft. high in the middle, without any prominent peaks, and gradually slopes to a low point on its N.W. side.

BOUGAINVILLE ISLAND is the next to the northward. Its South part

is mountainous, and some of its summits are very high, their form and disposition indicating that the island is here of considerable breadth. *Mount Balbi*, 10 miles inland, on the N.W. coast, was estimated at 10,171 ft. high. The coast appears to be very much varied, and covered with a thick forest; it is backed to the northward by a chain of immense mountains. The highest of these summits, says D'Urville, appeared, from the reflection of the sun, as if collections of snow existed in the ravines (December, 1838). The numerous smokes seen on the island were an evidence that it was more thickly peopled than the islands to the S.E. The sea abounded with fish in great variety, among which was an enormous ray, 8 or 10 ft. broad.

Capt. Fradin passed several dangerous coral patches, the southernmost of which was in lat. 5° 58′ 50″ S., long. 154° 44′ 28″ E., and two others, which he called St. Michel Banks, the northern of which was in 5° 52′ 46″ S., long. 154° 36′ 25″ E. These banks were thought to be from 6 to 8 miles from the coast, which is therefore placed too far to the West. The chart is very imperfect hereabout. In 1880, a sand-bank was observed from H.M.S. *Beagle*, having a tree on it and a reef off its S.E. end, in lat. 6° 10′ S., long. 154° 32½′ E.

Toward the N.W., Bougainville Island is bordered by a long extent of low land, in the middle of which several islets are seen. Numerous clumps of cocoa-nut trees adorn the beach, and even the higher grounds.

Empress Augusta Bay, on the West side of Bougainville Island, was surveyed by Captain von Schleinitz, of the German cruiser *Gazelle*, in August, 1875. It is about 14 miles in extent, North and South, and the same in depth, the soundings decreasing from 31 fathoms at half a mile from the shore to 4 fathoms within a cable's length of the beach. The shores are fringed with low mangrove, decreasing in breadth as the northern part of the bay is approached; imposing mountains form the background, among which, and to the northward, a volcano was seen in full activity.

Gazelle Harbour is a bight in the southern part of Empress Augusta Bay, formed by a small peninsula covered with mangrove trees, jutting out in an easterly direction, and is about a mile in length East and West, by half a mile in width, but the anchoring ground is confined to narrow limits, owing to coral reef extending from the shores of the South and S.W. parts of the harbour. Anchorage may be obtained in about 15 fathoms, about two cables from the shore, but with North and north-westerly winds it would probably be insecure. Fresh water was obtained from a small river about 2 miles northward of the harbour. No natives were seen near the harbour, but in the vicinity of a river about 9 miles to the northward, the boats of the *Gazelle* fell in with a large war canoe containing several.

The approximate position of the observation spot on Hüsken point, the South point of the bay, is in lat. 6° 30′ 18″ S., long. 155° 5′ E. It is high water, on full and change, in the harbour, at about 12^{h}; the rise and fall is 3 to 4 feet. The flood runs about 9 hours, and the ebb about 15 hours.

At about 6½ miles W. ½ N. of Hüsken Point, are two small detached patches

having a depth of about 16 ft. over them. At from 12 to 18 miles S. by W. ¼ W. of the same point, are four detached coral patches, having upon them depths of about 18 ft., with deep water near; and at about 7 miles south-eastward of these patches, or about 20 miles S. ½ E. from Hüsken Point, is a coral reef nearly awash, about 3 miles in extent, E.N.E. and W.S.W. It is probable that more foul ground exists off the western coast of Bougainville Island; great care is therefore necessary in navigating in this vicinity.

Cape l'Averdi, or *Laverdie*, is the N.E. point of Bougainville Island, and was thus named by its discoverer. D'Urville places it in lat. 5° 30′ 0″ S., long. 155° 7′ 14″ (155° 1′ approx.). It is a long, low, and wooded point, which projects considerably. The appearance of the coast is here much more pleasant, and of greater richness. Fleurieu supposes that the *Cape Cras* of Lieutenant Shortland and this are identical.

From the description given by Capt. Hogan (Oriental Navigator, p. 678), the North coast of Bougainville Island is remarkably high and picturesque. *Mount Cornwallis* appeared to be a volcano, emitting a great quantity of sulphurous smoke. The compass of H.M.S. *Danae*, in 1879, was considerably affected when passing the S.E. end of New Ireland and Bougainville Island.

The reefs appear to extend about 6 miles from the East coast of Bougainville Island. If bound to *Nouma Nouma*, in lat. 5° 54′ S., long. 155° 9′ E., Mount Balbi, on a S.W. by W. bearing, leads in, clear of the reefs, and a ship can then coast along to the southward until abreast the village. Anchorage was obtained near Nouma Nouma in a small bay to the North of the huts of the village. The beach of this bay is steep, and has no fringe reef.—*Captain Maxwell*, H.M.S. *Emerald*, 1881.

BOUKA ISLAND is the last of the Solomon Islands. It is much lower than its neighbour, and appears to be more fertile and well peopled. It was called by Carteret *Winchelsea Island*, and also *Anson Island*, but its proper name is *Bouka*. The strait separating Bougainville Island from Bouka was not well determined, but D'Urville passed near enough to see that it was very narrow, and apparently but little practicable. Bougainville was prevented from landing on its eastern side.

Captain Bristow sailed along its western side in July, 1812. He says:—"A chain of islands trends along it, connected by coral reefs; and on the inside of which, parting them from the real shore of Bouka, is a space of water that I take to be one continued harbour for several miles in length, and not less than 1 or 2 miles in breadth, East and West. Several openings in the reef lead me to believe that there would be no difficulty in finding an entrance. Off the N.W. part of Bouka there is a reef trending off to the West for about 2 miles: otherwise I saw no danger exceeding a mile from the shore."

The summit of the island is in lat. 5° 16′ 0″ S., long. 154° 33′ E.; and *Cape North* in lat. 5° 0′ 30″, long. 154° 35′ E. Cape North is stated to be of moderate elevation, with numerous low islets off it.

In concluding this very imperfect account of an archipelago geographically important, but still so little known, we quote a few particulars from Captain Cheyne, as to the inhabitants, to the character of whom our ignorance, and uselessness of the archipelago are owing:—With regard to the general character of the natives of the Solomon Islands, little can be said in their favour. They are the most treacherous and bloodthirsty race in the Western Pacific, and most notorious for cannibalism. These natives are so treacherous and rapacious in their habits, that at many of the islands they have their houses built on the most inaccessible spots they can find, so as to guard against treachery in the night. At the Eddystone some of the houses are built on its very summit. All caution and preparation are therefore necessary to guard against attack when in the neighbourhood or in any intercourse with these treacherous people.—(See also page 839.)

To the north-eastward of the principal range of the Solomon Archipelago, is a series of small and detached islands and shoals, some of which are of doubtful existence. The following is an account of them:—

SIKYANA, or Stewart Islands, are a group of four small coral islands and an islet,* discovered by Capt. Hunter, on his passage to Batavia, after the loss of the *Sirius*, 1791, and are visited by traders for cocoa-nut oil, which is prepared here. They are covered with cocoa-nut trees, connected by coral reefs, and visible from a ship's deck about 12 miles. The easternmost and largest isle (*Hogan's Island?*), 150 ft. high, is about 1¼ mile in length, and situated in lat. 8° 24′ 24″ S., long. 163° 2′ E.

The islet is situated on the North reef, about three-quarters of a mile to the westward of the above island. The group is about 3 miles broad at the base or West part. There is a canoe passage through the reef on the West side, between the northern and middle islands, leading to the lagoon. This is the only place, however, where a boat can enter. The reef is safe to approach all round, as no hidden dangers exist.

It is advised that all ships bound to China or Manila from New South Wales should sight this group, for the purpose of testing their chronometers.

The whole population, in 1847, amounted to 171 souls. Nearly all the males can speak English. They rear pigs and fowls, which they bring off and sell to ships for tobacco, calico, &c. The natives are recommended as trustworthy. —*Capt. Cheyne.*

These islands have been very seldom visited. A Norwegian barque called here in 1876. The natives produced a reference book, which showed that only nine vessels had called since 1852, and four of these were American whalers. The inhabitants were very friendly.

Roncador or Candelaria Reef.—In 1871, the pilot Maurelle, whose positions have been open to much discussion, after having passed what he supposed to be the Ontong Java Islands, discovered in the night a shoal all white with

foam on the N.E. quarter; from the noise made by the breakers he called it the *Roncador* (snorer), and then stood away. Its position, as calculated by Krusenstern, is lat. 6° 17′, long. 159° 14′.

In 1567 Mendaña discovered some reefs, which he named *Baxos de Candelaria* (Candlemas Reefs). They extended N.E. to S.W. 15 leagues, and their latitude was found to be 6° 16′. Admiral Krusenstern is of opinion that these shoals are identical with Maurelle's discovery, in opposition to Fleurieu and others.*

Roncador, or Candelaria Reef, is about 18 miles in circumference, having two openings in the S.W. part (the *Beagle* entered by the southern). On the western side of the reef there are several rocks above water, the northern being 10 ft. high; between this rock and another 6 ft. high, lying nearly 3 miles South of it, the reef is dry, having smooth water outside, and occasional boulders inside; on the eastern side of the reef the sea breaks heavily. The lagoon affords anchorage in from 15 to 20 fathoms, broken coral with occasional patches, which are easily seen from the masthead. Approximate position of the anchorage, lat. 6° 15′ S., long. 159° 14′ E. Fish are plentiful in the lagoon. It is high water, on full and change, at $3^h\ 30^m$; rise 6 feet (approximate).—H.M.S. *Beagle*, 1875.

ONTONG JAVA, or LORD HOWE ISLANDS.—The Ontong Java group were discovered by Le Maire and Schouten, June 20th, 1616, and again seen by Tasman, March 22, 1643, who gave this name to them. Le Maire and Schouten describe their discovery as consisting of five or six low and wooded islands, and several reefs. Le Maire says in his journal that the small islands seemed to be connected by low land. Tasman, who passed to the North of them, states that the number of the islands was twenty-two. *Howe's Group*, or *Lord Howe Islands*, were discovered by Capt. Hunter, in the *Waakzaamheyd*, May 14th, 1791. He states that they consist of thirty-two islands, lying in an East and West direction; he passed to the South of them. Admiral Krusenstern supposes these to be identical, and places them between lats. 5° 30′ and 5° 40′, longs. 159° 30′ and 160° 20′.

They were passed by Capt. Johnson, of the *Beemah*, in May, 1862, on his passage from Newcastle, N.S.W., to Shanghai. He made the West end to be in lat. 5° 24′ S., long. 159° 10′ E., and counted twenty-four islands. Broken water was seen to extend off the West end for a short distance.

From later observations it appears that these reports refer to different islands which are now known to form one group, lying approximately between lat. 5° and 5° 36′ S., and long. 159° 2′ and 159° 54′ E. They consist of a number of small and very low sandy islands, situated on and within a barrier reef,

* Bradley Reef.—On March 12th, 1791, Capt. Hunter discovered, in lat. 6° 52′ S., long. 161° 6′ E., a very dangerous reef, extending 5 leagues W.N.W. and E.S.E.; the breakers could be seen 2 leagues off. It was unsuccessfully searched for in H.M.S. *Beagle*, in 1875.

all covered with cocoa-nut trees, and thickly inhabited by a treacherous people, whose only weapon is the sling.

On the South side there are several small passages through the reef, and a good ship passage on its S.W. side, and another on its N.W. side. H.M.S. *Beagle*, in 1875, entered the lagoon by the S.E. passage; being intricate, it should not be attempted by a vessel under sail without a commanding breeze. The *Beagle* anchored off the village of Leueneuwa, situated on one of the easternmost of the islands. Capt. Hawkins, barquentine *Lord of the Isles*, 1882, entered by one of the southern passages and passed out by the N.W. passage.

In their vicinity in the month of July, the set experienced by the S.S. *Ripple*, 1876, was to the W.N.W., at from 2 to 2½ knots an hour.

On March 3rd, 1878, the British barque *Pacific Slope* experienced a volcanic shock in this neighbourhood, and a great quantity of pumice stone was found floating around the ship.

Frindsbury Reef, named after a whaler wrecked on it in March, 1832, is stated to be a dangerous coral reef, with heavy surf beating over it, and is placed by Horsburgh in lat. 5° 0′ S., long. 159° 19′ E. Its exact position is very doubtful, but it is thought to lie 3 or 4 miles W. by N. of the N.W. entrance to the lagoon of the Ontong Java group, or in long. 159° 9′ E.

Le Maire and Tasman's Isles.—After Tasman had made the islands to which he gave the name of Ontong Java, as above described, he saw, to the N.N.W. of them, another group. He gives no account of their number or extent, nor their distance from the former. This discovery was verified in 1824 by Captain Wellings, who discovered a group of low islands in lat. 4° 29′ S., long. 159° 28′ E. This group may be the same as Simpson's, described below.

Simpson's Coral Islands.—A group of low coral islands, covered with cocoa-nut trees, and inhabited; in lat. 4° 52′ S., long. 160° 12′ E., according to Mr. Thomas Beckford Simpson, of Sydney. It is possible that these islands form part of the Ontong Java group.

Marqueen Island, Cocos Islands, Mortlock Isles.—On June 22, 1616, Le Maire and Schouten discovered a group of twelve or thirteen islands, lying in a N.W. and S.E. direction, extending 1½ German league, and 32 leagues distant from the Ontong Java Islands. Le Maire speaks but of a single island, but William Schouten says that the whole group, by the closeness of the islands one to another, seemingly form but one. They called them *Marqueen Islands*.

In 1790, Capt. Wilkinson, in the ship *Indispensable*, discovered a group in lat. 4° 36′ S., long. 156° 30′ E. He called them *Cocos Islands*, but they probably are identical with the Marqueen Islands.

A group, to which Admiral Krusenstern applied the name of Mortlock Isles, was discovered by Capt. Mortlock, in the *Young William*, in 1795, in lat. 4° 45′ S., long. 157° 0′ E. He called them *Hunter Islands;* but as this name is given to several others in the Pacific, that of the discoverer was preferred.

Although there is some discrepancy in the recorded position, yet they may be taken as identical with the foregoing, until better observations determine their true character.

They must also be the *Massacre Islands* of Morrell, whose crew was cut off by the treacherous natives in May, 1830, on their coming here for biche-de-mer. His anchorage was in lat. 4° 50′ 30″, long. 156° 10′ 30″.

Carteret or Nine Islands.—Capt. Carteret, in 1767, discovered a chain of *nine* flat islets, which extended 15 leagues in a N.W. by W. direction; he considered them to be the Ontong Java of Tasman. Their South point would be in lat. 4° 55′, long. 155° 12′. Lieut. Shortland, on August 9th and 10th, 1788, saw four islands, 15 miles distant, trending in a N.W. by W. and S.E. by E. direction. His position (corrected) would be lat. 4° 50′ S., long. 155° 11′ E. Capt. Hunter, on May 18, 1791, saw a group of five small islands, connected by reefs, and two detached rocks; their direction was N.E. and S.W. The southernmost was in lat. 4° 53′ S., long. 155° 20′ E.

The accordance of these positions leads to the belief that they refer to one and the same group, which was found by the officers of the German war vessel *Carola*, 1883, to consist of six thickly-wooded islets, situated on a barrier reef lying between lat. 4° 35′ and 4° 55′ S., long. 155° 6′ and 155° 24′ E. On *Green Island*, the S.W. islet, is a trading station, and villages on *Yeeela*, 7 miles northward, and on *Yeharnu* on the western side of the reef. There are two passages on the S.W. side into the lagoon.

Groene Islands, or Sir Charles Hardy Island.—Le Maire and Schouten made, on June 22nd, 1616, three flat and wooded islands, which were named Groene Eylanden, or Green Islands. Carteret discovered, in 1767, an island in about the same position, which he named *Sir Charles Hardy Island*. Maurelle, in 1781, after seeing some islands which he took for Ontong Java, passing to the westward, saw *two* islands, which he called *Caymanes*. Capt. Hunter saw it, May 19, 1791; the inference was that all these referred to the same land, notwithstanding the discrepancies as to the *number* of the islands, for Capt. Bristow, in July, 1812, discovered the passages between them. They were thus imperfectly known till November, 1861, when Capt. Fradin sailed past their western side in the *Saint Michel*, and found that there were *four* islands close together. The largest and southernmost island, which is 13 miles long N.N.W. and S.S.E., has a fine bay at the N.W. end. The South point of this island is in lat. 4° 38′ S., long. 154° 10′ E. The northern isle is 9½ miles long, and its North point is in lat. 4° 17° S., long. 154° 0′ E. They are covered with vegetation to the water's edge, and no dangers beyond the breakers on the coast; but from the N.W. extremity a (coral) reef apparently projects for about a mile to the N.E.

In concluding the very imperfect notices of this range of islands, which, taking the same general trend as the Solomon Islands, it may be remarked

may either be more in number or less than here stated, it is probable that all the islands or shoals may occupy the same line of direction, or nearly so. The works of Krusenstern, Burney, and Purdy, will give all the particulars of the discussion. Admiral Krusenstern's opinions have been followed here.

Rennell Islands.—These two islands to the southward of Guadalcanar, named Rennell and Bellona, were apparently discovered by Capt. Wilkinson, in the *Indispensable*, in 1790. It is said that copper ore is abundant on them. According to Lieut. Richards, 1878, *Rennell Island* is about 45 miles long E.S.E. and W.N.W., and 6 or 7 miles broad where widest. It is of uniform height, about 400 ft., and densely wooded, but apparently affords no anchorage. Its S.E. end is in lat. 11° 52′ S., long. 160° 40′ E.; the West end is in lat. 11° 34′ S., long. 159° 55′ E., and is marked by a hummock situated about 200 yards from the beach. Off the S.E. end a fringing reef extends a short distance, and along the whole N.E. side is a fringing reef about 2 cables from the shore. A reef extends 4 or 5 cables from the West point, around which a strong tide was observed to be rippling. The natives resemble the Tanna (New Hebrides) islanders.

Mr. Miles, of the brig *Rio Loge*, 1878, states that Rennell and Bellona Islands bear from each other N.W. by W. and S.E. by E., not more than 15 miles apart, which will place the S.E. end of *Bellona Island* in lat. 11° 23′ S., long. 159° 47′ E. Bellona, which is small, appears to be of the same height as Rennell Island, and thickly wooded.

Indispensable Reefs, also discovered by Capt. Wilkinson, were examined by Lieut. Richards, H.M.S. *Renard*, 1878. They were found to consist of three separate reefs extending 57 miles in a N.W. and S.E. direction, and steep-to all round. *North Reef*, enclosing a deep-water lagoon, is 12 miles long in an E.S.E. and W.N.W. direction, and its greatest breadth is 4 miles; its N.W point, marked by two conspicuous rocks, is in lat. 12° 15′ S., long. 159° 59¾′ E. There are two narrow openings in the reef, one on the West side, situated 3 miles southward of the two rocks, and the other on the North side, 5 miles from the East point. The current runs strongly to the westward along the North side of the reef.

Middle Reef, separated from North Reef by a passage 1½ to 2 miles wide, extends in a S.E. direction for 22 miles to a point, off which is a heavy tide rip. Thence the reef curves gradually to the westward and to the southward, thus forming a deep bight. From the South end, in lat. 12° 49′ S., long. 160° 25′ E., the reef trends gradually to the westward and northward for 17 miles, where it terminates. No soundings with 150 fathoms of line could be obtained between the extremities of this reef; the interior also appeared very deep. *South Reef*, separated from Middle Reef by a deep passage about

2 miles wide, encloses a deep-water lagoon, and is 13 miles long and 5 miles broad, of an oblong form, and having a horse-shoe curve in the South side. Its South point is in lat. 13° 2′ S., long. 160° 31′ E.

The current hereabout sets to the westward, and on striking Indispensable Reef appears to divide into two branches; one setting to the N.W. along the reef, and the other to the S.W. Between Rennell Island and Indispensable Reefs the current sets strongly to the westward; a set of 49 miles in twenty-four hours was observed on one occasion. It is probably much influenced by the wind.

Schofield or Neptune Reef.—In August, 1868, the ship *Neptune* was wrecked near the middle of the eastern edge of a reef to the southward of the Solomon Islands, in lat. 12° 54′ S., long. 161° 45′ E. Her commander, Capt. Robert Schofield, says the reef was 16 to 18 miles long by about 7 miles wide, forming a deep lagoon. A careful but unsuccessful search was made for this danger in H.M.S *Renard*, 1878, and as other vessels have been in the vicinity without seeing anything of it, it seems probable that the *Neptune* struck on Indispensable Reefs.

Well's Reef was discovered by Capt. N. Edwards, in H.M.S. *Pandora*, in 1791, the vessel having become embayed during the night in a double reef, the East end of which was stated to be in lat. 12° 20′ S., long. 157° 58′ E. A search for this reef was also made in H.M.S. *Renard*, but unsuccessfully, no bottom being found at 150 fathoms in this locality.

Pocklington Reef, discovered by a commander of that name, in 1825, was examined in H.M.S. *Lark*, in 1880. It is a coral reef, 18 miles long N.E. by E. ½ E. and S.W. by W. ½ W., its greatest breadth being 3 miles. The East extreme is in lat. 10° 45′ 25″ S., long. 155° 51′ 40″ E. There are several large boulders upon its northern side, and about the middle of the South side there was the wreck of a large iron ship. There is no anchorage around this reef.

Capt. Bache, barque *Queen of Nations*, 1880, reports that he saw breakers, rocks, and sand, extending between the bearings of S. by W. and W. by S., distant about 5 miles, and in lat. 10° 6′ S., long. 156° 7′ E., or about 50 miles N.E. of Pocklington Bank.

NEW BRITAIN.

Dampier was the first to decide that this was a distinct island; prior to his voyage, it was supposed to form an integral part of New Guinea. Its southern side was examined by Dampier, and has been more exactly described by the celebrated D'Urville, under very adverse weather. On the North side D'Entrecasteaux is the principal authority, though his observations were very imperfect for a survey. Its native name is *Birara*. It is a peculiar shaped angular

island, trending 140 miles S.S.W. from Cape Stephens to Beechey Point, and thence 170 miles W. ½ N. to its western point, and probably nowhere more than 40 miles in breadth.*

The northern peninsula of New Britain is named *Gazelle Peninsula*, after the German vessel of that name. The land composing it is hilly, the most conspicuous heights being *Mount Studer* in the N.W., the remarkable hills N.E. of Blanche Bay, which Carteret named the *Mother and Daughters*, and *Mount Beautemps Beaupré*, 1,640 ft. high, near the centre of the peninsula.

Cape Stephens, with a few rocks close off it, is the northern extremity of New Britain, and from it the coast trends about 9 miles S.E. to *Praed Point*, on the northern side of the entrance to Blanche Bay. It is also the S.E. point of *Crater Peninsula*, on which are the *Mother* and *North* and *South Daughters*, respectively 2,470 ft., 1,866 ft., and 1,727 ft. in height, and all covered with vegetation; they are very remarkable, and may be seen in clear weather at a distance of 60 miles. At a mile West of the South Daughter is a small flat-topped active volcano, which emitted vast columns of black smoke.

BLANCHE BAY, an extensive bay containing several good anchorages, was discovered by H.M.S. *Blanche*, in 1872. Its North side is formed by Crater Peninsula, above described. The entrance of the bay, between Praed and Ruluanna or Schulze Points, is about 3 miles wide, and suitable for the largest ships. It extends in for 6 or 7 miles, and is surrounded by beautiful scenery, with many natives living on its shores. Good anchorage was found in *Albino Bay*, one-third of a mile from the beach, in 14 fathoms, black sand, with the centre of the South Daughter or eastern mountain bearing N. ½ W. There is also sheltered anchorage in 10 to 14 fathoms, westward of the reef extending one-third of a mile off Schulze Point.

Farther in are two good harbours, the smallest, named *Greet* or *Great*, being formed by an indentation in the North shore, with *Henderson* or *Matupi Island* on its West side. Off the N.E. end of this island a small spit projects, the observation spot on which is in lat. 4° 13′ 20″ S., long. 152° 10′ 18″ E. Off this spit there is good anchorage in from 8 to 14 fathoms; it is reached from the southward, as a reef joins Matupi Island with *Bridges Point*, which separates Greet and Simpson Harbours. A patch with 3¼ fathoms on it lies off the East end of Matupi, thus narrowing the navigable channel to about 3 cables. The depths in the harbour are constantly undergoing changes from volcanic action, and vessels should use caution in approaching the shores of the bay.

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* Some later information is obtained from a paper by Mr. Wilfred Powell, entitled "Observations on New Britain and neighbouring Islands, during Six Years' Exploration," published in the "Proceedings of the Royal Geographical Society," February, 1881, pp. 84–97, with a Map. See also a book published in 1883, by the same author, entitled "Wanderings in a Wild Country."

On Matupi Island, which is thickly populated, and said to be healthy, is a German trading establishment, where coal and provisions can generally be obtained. There is monthly communication with Sydney by sailing vessel, and by steamers with Cooktown more frequently. Supplies of yams, taro, cocoanuts, eggs, pigs, and fowls, may be procured from the natives by barter. Fresh water is scarce; that obtained by digging in the sand, on the North shore of the bay, is brackish. On the West and South sides, small supplies of water may be obtained, but vessels generally prefer to replenish their stock at Makada Harbour, in the Duke of York group.

The natives of Blanche Bay appeared similar in race to those of New Hanover and New Ireland, but more civilized, though not so stalwart. Much attention is paid by them to cultivation.

It is high water, on full and change, in Greet Harbour, at about 9^{h}, once in every 24 hours; springs rise $2\frac{3}{4}$ ft., neaps $1\frac{1}{2}$ foot.

Simpson Harbour, to a vessel making any stay, is preferable to Greet Harbour. It affords better anchorage and shelter, at about a quarter of a mile from the beach in its northern part, in from 8 to 10 fathoms, black sand. It has ample space, being 3 miles deep and $1\frac{1}{2}$ mile wide. In entering, the channel westward of the two Beehive Rocks is the best, as a 10-ft. shoal lies between them and Bridges Point. There is good anchorage in 10 fathoms, mud, about a quarter of a mile off shore, nearly midway between Bridges Point and the creek nearly a mile northward of it. *Beehive Rocks*, 205 ft. high, lie 7 cables S.W. by W. $\frac{1}{2}$ W. from Bridges Point. A population of 200 was inhabiting the narrow ledge surrounding these rocks.

On the West side of the bay is *Volcano Island*, about three-quarters of a mile in diameter, which rose from the sea to a height of 70 ft. at the time of the volcanic eruption and tidal wave in February, 1878. Northward of it there is anchorage. Water can be obtained from a small stream abreast the South end of the island.

South-eastward of Blanche Bay anchorage may be obtained, during southerly winds, about midway between Ruluanna and Gazelle Points, with the South Daughter bearing N.W., westerly. About a mile eastward of this a river disembogues in a small bight, where water may be obtained. In mid-channel between this and the Duke of York group are the two small *Credner Islands*, surrounded by a reef to the distance of about half a mile.

Cape Gazelle, or *Perara Point*, the N.E. extremity of New Britain, terminates abruptly. No bottom could be found at 15 fathoms at half a mile from it. The shore hereabout is covered with extensive forests, having many clear spots or plantations. From this cape the shore recedes to the southward, projecting again at a distance of about 17 miles S. $\frac{1}{2}$ W. at *Cape Palliser*, the *Pointe de l'Entrée* of D'Urville. *Cape Buller* lies about 18 miles farther S.W. The coast consists of a low mountain range rising abruptly from the beach; some lofty peaks are visible far inland.

"At noon we found ourselves at 10 miles to the E.S.E. of Cape Buller, before a deep embayment, which exists between Cape Buller and Cape Orford, and which in this part must reduce the connection North of New Britain to a narrow isthmus. From this part the peak, which corresponded very well with D'Entrecasteaux's *Deschamps Peak*, was very remarkable in the West." —*D'Urville.*

Wide or *Spacious Bay.*—About 11 miles beyond Cape Buller is *Archway Point* formed by a curious natural archway, 7 miles beyond which is the extremity of *Tongue Point*, so named by Mr. Powell, a narrow promontory projecting about 3 miles to the South, on the North side of Henry Reid Bay. The natives between this and Cape Palliser were found to be hostile, using the sling with great precision.

Henry Reid Bay forms a complete harbour, about 4½ miles in diameter, with an average depth of 20 fathoms. Its shores are well wooded, and on its N.W. side are two rivers; at the mouth of the southern one the depth was 2½ to 3 fathoms, and thence Mr. Powell ascended it for a distance of 3 miles in a steam launch. About 1½ mile to the northward of Turner Point, the South entrance point of the bay, a small breaking reef was observed. From Turner Point to *Return Point*, the land is low for a distance of 4 miles to the South; the natives here were friendly, though cannibals. Heavy breakers were seen about 1½ mile to the N.E. of Return Point.

Cape Orford (Dampier), which is at the South point of Wide Bay, is composed of three rounded points, with a very high and perpendicular cliff, backed by very high mountains. It is in lat. 5° 21′ S., long. 152° 10′ E. (approx.).

Between Cape Orford and *Quoy Peak* (lat. 5° 30′, long. 151° 44′), a distance of about 30 miles, the coast is uniformly high, steep, and covered with thick forests. Quoy Peak is an immense mountain, and very remarkable from its isolated position. It is in the form of a very regular cone, when viewed from seaward. *Point Owen* lies about midway on this coast. *Jacquinot Bay* lies to the West of Cape Quoy, and is terminated to the S.W. by *Cape Cunningham.*

Port Montagu was also named by Dampier in honour of his noble patron. He was here in March, 1699. He watered in a small river in its N.E. part, and bartered for provisions, pigs, &c., with the natives, who he found rather disposed to be troublesome, though his treatment did not warrant much else. Capt. D'Urville, when here in July, 1827, experienced a long continuance of very bad weather, which prevented a more close examination. Its eastern point was named *Point Dampier* by him, and he states it to be a high, steep, and conspicuous promontory. Westward of this D'Urville saw but imperfectly from the bad weather.

Roos Islands, which are low, lie about 30 miles westward of Cape South; and at about the same distance to the westward of these again is a considerable group, which D'Urville named *Gracious Isles* (Iles Gracieuses). The land of

New Britain itself, which was imperfectly seen at intervals, consists of high mountains.

DAMPIER STRAIT is limited on the East by the West extremity of New Britain, and on the West by an island named by Dampier *Sir George Rook's Island.* It was the discovery of this passage that caused Dampier to name the island to the East Nova Britannia, it having been previously represented as part of New Guinea.

According to the examinations of D'Entrecasteaux and D'Urville, the greater portion of the southern entrance to Dampier Strait is obstructed by dangerous reefs, on which both the ships of these commanders nearly met with serious accidents. Dampier was more fortunate, though he notices these coral reefs, so that it is probable that there are channels between. To avoid them, you must keep near the coast of New Britain. D'Urville was set nearly 20 miles to the West in the course of the night, when to the southward, and this ought to be carefully considered in traversing it.

The channel between Rook Island and New Guinea appears to be free from dangers; in passing through it keep on the New Guinea side, with the beach in sight 6 or 7 miles distant.

In 1880, Capt. Miller, S.S. *Bowen*, reported having struck on a 12-ft. coral shoal, from which the summit of Tupinier Island was in line with Cape Ann, N.W. ½ W. Lat. 6° 3½′ S., long. 148° 37′ E. About 2 miles southward of this shoal discoloured water, with slight breakers, was seen. The barque *Alice Mary*, 1879, also struck on a coral reef, with 8 ft. over it, said to lie on the same bearing as the above in lat. 5° 55′ S., long. 148° 35′ E., and 7 miles off shore. They may possibly be the same.

Of the western part of New Britain all speak in high terms. From some good observations made by M. Jacquinot, on board the *Astrolabe*, the longitude of the West Cape of New Britain was found to be 148° 17′ 2″, measured from Carteret Harbour, and which only varied two minutes from that by D'Entrecasteaux; the mean (which is given above) is therefore taken.

Around *Cape Gloucester* there are numerous volcanic mountains, which Mr. Powell describes as being very active. The natives hereabout were treacherous.

Volcano Island, which served as a beacon to Dampier, who discovered it on the evening of March 24, 1700, according to D'Urville's observations, is in lat. 5° 32′ 20″ S.; Dampier says lat. 5° 33′, a proof of his accuracy. The latter, in his account of it, says:—"The island all night vomited fire and smoke very amazingly; and at every belch we heard a dreadful noise like thunder, and saw a flame of fire after it, the most terrifying I ever saw." Its form is that of a very regular cone, broken at the summit, about 3,500 ft., and its diameter at the base about 3,700 ft. The form of this protuberance and its remarkable escarpment on all its faces sufficiently indicate that it has arisen directly from the depth of the ocean, and that it was probably the last of these burning

masses which were still increasing over two centuries ago, like a chain of volcanic spiracles to the North of New Guinea.

Rook Island, which, as before mentioned, was named by Dampier after Sir George Rook, is about 22 miles in length, and 10 or 12 miles broad. It is formed inland of high and imposing mountains. Its N.W. point is *Cape King*, in lat. 5° 29′, long. 147° 46′.

Lottin Island, about 11 miles N.W. of it, is a volcanic cone, 3,000 ft. high, from which smoke issues from a large hollow on the N.E. side. Between Lottin and Rook Islands Capt. Lass, of the brig *Wailua*, stated that he discovered a small island, Oct. 28, 1861, about half a mile in circumference, and covered with trees.

Tupinier Island, which was seen, but not named, by Dampier or D'Entrecasteaux, lies to the North of Volcano Island; it is a very high active volcano, and falls in gentle declivities in every direction to the sea. It is not more than 12 miles in circuit, and is most probably inhabited, for smoke was observed in different parts. Lat. 5° 26′, long. 148° 8′.

Capt. Rogers, barque *Alice Mary*, states that there is an islet lying 1½ mile N.W. of Tupinier Island, and also that a small island, half a mile W.N.W. from Lottin Island, forms a good harbour.

Whirlwind Reef, upon which rocks above water and breakers were seen, is said to lie with Lottin Island bearing S.W. ½ W., Cape Gloucester S.S.E., and Mérite Island E. ½ N.

It is to the voyage of D'Entrecasteaux that we owe what little knowledge we have of the western part of the North coast of New Britain. But there is a melancholy interest in this: it was the last of the labours of that commander, who shortly after died in hurrying back to Java to recruit.

Mérite Island, the first point named in this exploration, was first seen June 30, 1793. It is tolerably high, and its highest part is in lat. 4° 54′, long. 149° 5′. To the North and N.E. of it are several other islands, the easternmost of which appeared to be the largest; this was called *Des Lacs Island*, and the group *Françaises Islands* (French Islands). They all appear to be tolerably high, and their coasts, as far as could be seen, were quite clear: but off the S.W. point of *Forestier Island* there are several islets, the outermost of which is rather more than a league off.

Nord or *North Island* is 23 miles to the North of Mérite Island, and on November 5, 1861, Capt. Lass discovered a singular shoal, 5 miles to the N.W. of it, about half a mile wide and 5 miles long, of a crescent shape. Suddenly it showed like a whale blowing, but on approaching it, it was found to be a boiling spring, emitting water about 150 ft. into the air. This spring could be seen 20 miles off.

Gipps Island, discovered by Capt. F. J. King, Oct. 1, 1842, is to the North of Nord Island, in lat. 4° 15′ S., long. 149° 10′ 30″ E. It is a round sugar-loaf island, about 3 miles in circumference, and surrounded by a reef, which on the

eastern side extends 3 miles from the land, forming a good harbour for small vessels, with an entrance from the North. The island is well inhabited. There is a boiling spring on a sandy beach on the S.E. side of the island, and another on the S.W. side, which threw up boiling water at times upwards of 20 ft.

Willaumez Island, which is to the S.E. of Des Lacs Island, is 18½ miles long, tolerably high in the centre, but the extremes are very low. The trees which cover it from the sea-shore to its summit indicate great fertility. The island is apparently quite uncultivated, and but few resources could probably be gained from its inhabitants. Its extreme North point, a high cliff steep-to, is named *Cape Campbell*, with two small rocky islets just South of it. Its South point is in about lat. 5° 15′ 3″, long. 149° 59′ 30″.

To the South of Willaumez Island are three other smaller but high and wooded islands, named *High*, *Raoul*, and *Gicquel*, all apparently volcanic. The passages between these islands appear to be full of reefs. *Fitz Island*, 17 miles S.E. of Cape Campbell, is small, with two hummocks about 100 ft. high, and two remarkable rocks on its North shore.

The whole of the North side of New Britain, or as far as was seen, appeared to be lofty. *Cape Wilson*, a long, low, thickly-wooded point, in lat. 5° 7′ S., long. 150° 2′ 30″ E., was the western limit of Mr. Powell's explorations. Midway between it and *Deception Point*, a similar point about 20 miles to the eastward, lies *Du Faure Island*, 7 miles long W. by N. and E. by S., with two mountains upon it about 1,000 ft. high. Westward of Deception Point there appears to be a large indentation in the coast, and about 5 miles eastward of it is *Macullock Point*, fringed by a reef running about 6 miles to the N.E. To the South of the latter point is *Two-peak Mountain*, 2,000 ft. high.

At 15 miles S.E. of Macullock Point is *Cape Hoskins*, on the North side of *Commodore Bay*, which appeared to be full of shoals and reefs, with a small rocky island in it named *Norton*, 1½ mile from the coast. Cape Hoskins is bold and cliffy, backed by high land, but a dangerous reef runs 3 miles eastward of it. At 5 miles westward is *Mount Pyramid*, 2,000 ft. high, so named from its perfect shape.

At 3 miles eastward of Island Point (to the N.W. of Cape Hoskins), is *Jenkins Island*, about 3 miles long, with reefs extending about 3 miles from each extremity. The channel between it and the coast appeared to be dangerous. About 6 miles E. by S. of Jenkins Island is *Fairway Reef*, about 3 miles long N.E. and S.W., with two sandbanks on it, that on the N.E. end dry at high water, and the other awash.

The coast from Commodore Bay to Low Point, to the N.E., was not examined by Mr. Powell, with the exception of *Hummock Head; MacDonald*, *Vessy*, and *Chard Islands*, lie off this part of the low and shelving coast. *Low Point* and *Long Point*, 8 miles to the N.E. of it, are both long and low.

Duportail Island, about 4½ miles West of Long Point, is 5 miles long, by

2¾ miles wide, with two small islands from 3 to 4 miles westward of it, and a dangerous covered coral ridge about halfway between. Near the S.W. end is an active volcano, and at the N.E. end is a conical peak. Mr. Powell describes the natives as timid.

Cape Deschamps, 7½ miles to the N.E. of Long Point, is steep-to, with high cliffs, and close to the N.E. of it is *Ledanseur* or *Heath Island*, steep-to all round, and about 200 ft. high. From 4 to 5 miles inland of Cape Deschamps, Long Point, and Low Point, lie respectively the *North Son*, an extinct volcano, 1,300 ft. high, the *Father*, an active volcano, 4,000 ft. high, and the *South Son*, 3,000 ft. high, also an active volcano.

To the eastward of Cape Deschamps is *Open Bay*, about 15½ miles wide across its entrance, and reaching to within 4 miles of Wide Bay, on the East coast. Its South side is broken into smaller bays fringed by reefs, and very deep. *Hixson Bay* was not examined. The entrance of *Port Powell*, on the North side of Open Bay, is about a quarter of a mile wide, opening inside to a width of 1 mile by 1¾ mile in depth, with 15 fathoms, mud. It is well sheltered, and would form a capital place for refitting small vessels. Fresh water can be obtained on its eastern side.

At 5 miles West of Port Powell is *Sandy Point*, a low, white projection, with shallow water a considerable distance off it. *Turtle Island*, lying off the entrance to Port Powell, has several reefs around it.

From Sandy Point to Cape Lambert the coast is fronted by numerous reefs reaching far to seaward, within which there is anchorage for small vessels at one or two places on the coast. At 3 miles northward of Sandy Point is *Holmes River*, at the head of which is a waterfall, visible from sea. Mr. Powell went up the river in a boat as far as the fall. At *Pondo Point*, 10 miles farther to the N.W., a remarkable red patch may be observed on the side of a mountain.

Cape Lambert is the name given by Krusenstern to the cape taken by D'Entrecasteaux for Cape Stephens (p. 876), which lies to the East of it. It is the N.W. projection of Gazelle Peninsula, and lies in about lat. 4° 9½′ S., long. 151° 37′ E. The cape is bold and steep, and about 10 or 12 miles to the westward of it lie a narrow chain of reefs, extending about 8 miles North and South, at the North end of which is *Elizabeth Reef*, dry at low water, and apparently volcanic, in lat. 4° 5′ S., long. 151° 30′ E. At the southern end are some dry sand-banks. The natives report that these reefs extend outside the *Scilly Isles*, and join those eastward of Matukanaputa Island. North of Cape Lambert is a reef marked on some charts as *Princess Royal Reef*, on others *Sherwood Reef*. To the North of this, and 13 to 15 miles northward of the cape, are two shoals, nearly level with the sea, with a deep channel 200 yards wide between them, discovered in September, 1842, by Capt. F. J. King, in the *Waterwitch* sperm whaler. He called them *Legelis Shoals*.

Father and Son are two shoals 3 miles apart, W. by S. and E. by N. The

former, or eastern, is a round patch which breaks, the other a long reef. The Son lies in lat. 3° 56′ S., long. 151° 0′ 15″ E.

Horton Banks are two sand-banks, about 3 ft. above the sea, showing very white, with neither tree nor shrub on them, and apparently a safe channel between them. The East bank is in lat. 4° 27′ S., long. 151° 15′ E. The other lies 5 miles to the West of it. Their position is doubtful.

Between Cape Lambert and Cape Stephens the coast is indented with several bays and harbours, and numerous reefs with some islands lie off it. *Scilly Islands*, a group of six low, uninhabited, wooded islets, lie about 6 miles northward of Cape Lambert. *Byning Bay*, 5 miles eastward of Cape Lambert, is deep, with anchorage for small vessels between a reef and the eastern side of the bay. The natives were friendly. *Matava Bay*, situated between Materbert Islet and the shore, 9 miles eastward of Cape Lambert, is a small but well sheltered anchorage, having depths of 10 to 13 fathoms. Good water may be obtained. To the eastward is Matukanaputa Island, with many cocoa-nut trees, and some native houses on it.

Port Weber, about 18 miles eastward of Cape Lambert, was reported by Capt. Levenson, of the German barque *A. T. N.* There is good anchorage in 6 to 10 fathoms, and water may be had at Kabair village. The natives were civil and kind. There is also good anchorage off the trader's house, in 18 fathoms, sand, about a quarter of a mile from shore, where water and native provisions may be obtained. Mount Beautemps Beaupré forms a good mark for entering the bay, which is said to be clear of reefs. Off the entrance of the bay lies *Urara Island*, low, and thickly inhabited, with reefs extending N.W. of it; between it and *Cape Luen* are three detached reefs, and a reef also extends about halfway across from the cape to the island.

Man Island, lying about 5 miles off the coast, midway between Capes Luen and Stephens, is 4 or 5 miles in length, with a ridge 650 ft. in height, deeply furrowed and covered with vegetation. Midway in the western part of the passage between the island and the shore is *Midway Reef*, about a cable in length, and awash at low water; in passing through this channel, keep near the island. The natives on Man Island are apt to be troublesome.

Luen Bay, between Luen Point and Shoal Point, has fair anchorage for small vessels. A reef runs about a mile off Shoal Point, terminating in shallow and dangerous water. From hence the Kabakadai coast runs in a straight line to E.N.E., and is fringed with a reef, with from 20 to 6 fathoms, good anchorage ground, at three-quarters to half a mile off it. The shore is thickly populated, and lined with cocoa-nut trees. Fresh water may be obtained.

In *Kabakadai Bay*, 6 miles S.W. of Cape Stephens, there is anchorage in 13 fathoms, with the white cliff bearing S.W. by W., but it is not recommended. There is also anchorage in 6 fathoms, about half a mile off the trader's house, where water and native provisions may be had. The mission house, upon the bluff above Kabakadai Point, is visible about 5 miles. At *Ratavoul*, about 2

miles westward of Cape Stephens, vessels can anchor in 10 to 12 fathoms, sand with two remarkable trees on the beach bearing S.S.E., about a quarter of a mile distant. Native provisions can be had here, but no water. Four native teachers, belonging to the Wesleyan mission at the Duke of York group, were killed and eaten by the natives in *Tarlily Bay* in 1878.

Conflict Shoal is a dangerous reef in the eastern part of the passage between Man Island and the shore; it is about 150 yards long, N.E. and S.W., and partially uncovers at low water. As the coast has not yet been surveyed, it is difficult to assign a correct position to Conflict Shoal; 2½ miles off the shore appears best suited to the chart.

The islands of the Duke of York group are described hereafter.

NEW IRELAND, ETC.

The N.E. side of this island was discovered by Le Maire and Schouten in 1616, and was again seen by Tasman in 1643; but these navigators supposed it to form a portion of the large island of New Guinea. This supposition was disproved by Dampier, who sailed through the strait now bearing his name in 1700; but all the land to the eastward retained the name of *Nova Britannia* till 1767, when Carteret found that the bay, called by Dampier St. George's Bay, was in reality a strait separating it from the two islands; the land to the eastward then received the name of *New Ireland*, that to the westward retaining the title of New Britain. Its native name is *Tombara*.

The island is still very imperfectly known; with the exception of the greater part of its southern coast, which has been more recently visited, we are obliged to resort to the accounts of the original discoverers, necessarily very imperfect authorities. According to these, the island extends about 180 miles in a N.W. by W. and S.E. by E. direction, its eastern coast extending 55 miles N. by E. ½ E. and S. by W. ½ W.

In 1875, Capt. von Schleinitz, of the Imperial German vessel *Gazelle*, examined some parts of the South coasts of New Hanover and New Ireland, and the information then gained is inserted in the following description.*

The greater part of this island, as well as those in its vicinity, have been very badly represented on the charts—an evil much to be deplored, since the passing traffic between Australia and China renders accuracy of some importance. At the N.E. part the configuration is said to be incorrect.

Generally the North coast is bold to approach all along (of which there can be no more certain sign than that sperm whales are always found making their

* See also a paper by Mr. G. Brown, "A Journey along the Coasts of New Ireland and neighbouring Islands," in the "Proceedings of the Royal Geographical Society," April, 1881, pp. 213 - 220.

passage along the shore close in), with a clear passage between it and the islands in the offing, decidedly preferable to the passage outside of these islands, unless you keep very near to the equator, as some of them are very low.

In aspect, the N.W. part is low and flat, having almost the appearance of coral islands, with cocoa-nut trees. This description maintains about 20 miles to the eastward, or to long. 150° 55′ E.; it then changes its character, and, rising into bold land, undulating and increasing in height, until in 152° 8′, it has reached 2,500 ft. From hence it again lowers in two places remarkably, but is still bold, until you approach the N.E. point, lat. 3° 56′ S., long. 152° 56′ E., when it is elevated into high towering peaks of about 7,000 ft. This is the only part where the island has any breadth, or where you can see one hill rising over the other. The other part has all the appearance of a mere narrow strip of land.—*Capt. Hunter.*

Cape St. George is the southernmost point, and, from the observations of Duperrey at Port Praslin, it is in long. 152° 48′ 14″; D'Entrecasteaux places it in lat. 4° 51′ S. It may be recognised from the south-eastward by a white patch on it resembling a vessel under sail. *Lavinia Bay*, 1 mile to the N.E. of the cape, affords good anchorage during westerly winds in 5 to 7 fathoms, sandy bottom, inside the bluff forming the South side of the entrance. There is a large river entering the bay. The natives were hostile. *Port Praslin* and *Carteret Harbour*, at 1½ and 9½ miles to the N.W. of Cape St. George, are described hereafter.

Likiliki Bay, 5 miles N.E. of Cape St. George, was the site of the proposed settlement of *Port Breton*, under the auspices of the Marquis de Rays, in 1877. The settlers nearly all died from the hardships they underwent, and the Marquis was prosecuted before the French courts, and sentenced to four years imprisonment and a fine of 3,000 francs.

Cape Santa Maria, about 55 miles N. by E. ½ E. from Cape St. George, is in about lat. 4° 2′ S., long. 153° 10′ E., and is the easternmost point of New Ireland; and hence the coast assumes a new direction, trending away to W.N.W. "The land between the two capes last named is high, mountainous, and wooded; numerous points jut out, forming as many fine bays. The only sign of anything like a harbour along the North side of New Ireland is to the eastward of a low point, which is that next to the westward of the N.E. point, the blue water appearing in this place of some extent within the reef. In two or three places low land juts out about a mile from the steep cliffs, which probably might afford anchorage close in, but altogether very exposed."—*Capt. Hunter.*

St. John Island lies off Cape Santa Maria, and was so named by Tasman from the day it was first seen. Bougainville calls it *Bournand Island.* Its S.W. and N.W. extremities are very high, and the middle very low, so that when seen from S.E. or N.W. it shows distinctly as two islands. According to Capt. Fradin, in 1861, its N.E. point is in lat. 4° 2′ S., long. 153° 46′ E.,

agreeing exactly with our previous position. Sir Charles Hardy Islands, the next to the S.E., are described on page 873.

Anthony Kaan Island, of Tasman, is probably the *Oraison Island* of Bougainville, who places it in 3° 30′ S. Both these navigators speak but of one, but Dampier (whose accuracy is proverbial) says:—"On the S.E. part of it are three or four small woody islands, one high and peaked, the other low and flat; all bedecked with cocoa-nut trees and other wood." Dampier passed between them. From later information they are ten in number, the centre of the group being in lat. 3° 32′ S., long. 153° 30′ E. The natives are described as ferocious.

Faed Islands, or Abgarris.—This group, eastward of Kaan Islands, was discovered by Capt. Renneck, of the *Lyra*. They occupy a space of 9 leagues in a N.W. and S.E. direction, and are composed of a chain of low islands and sand-banks, surrounded by a reef, the North part of which is in lat. 3° 9′ S., long. 154° 22′ E. (approximate).

Goodman Island is the southernmost of Faed Islands. It is separated from the rest by a channel which Captain Renneck could not examine. To the South of this island is a detached shoal, with a reef, in lat. 3° 33′ S., long. 154° 37′ E.

Gerrit Denys Island, another discovery of Tasman, is called by Bougainville *Ile du Bouchage*. In the bays are abundance of cocoa-nut trees, and the timber appeared to be fine. The natives will come off in canoes with cocoa-nuts, taro, plaintains, &c., for barter to passing ships.

The middle of this island is in about lat. 3° 8′ S., long. 152° 37′ E. Captain Hunter says it is the highest of the islands lying off the North side of New Ireland (about 3,200 ft.), and of a very rugged and uneven appearance; in shape triangular, and having a fine stream on the N.E. part, at which several ships have watered.

Luise Harbour, about the centre of the East coast, is the only harbour, and affords safe anchorage with all winds except those between N.E. and East. Close eastward of the N.E. point is a reef, on which are the islands of *San Bruno* and *San Antonio*, and at 3½ and 12 miles respectively to the northward are *San Joseph* and *San Francisco Islands*, about 650 ft. high. The latter is thickly wooded and even-topped.

Lyra Reef was discovered, February 8, 1826, by Capt. Renneck, commanding the ship *Lyra*, belonging to the well-known and enterprising merchants, Messrs. Enderby. It is a narrow belt of rock, extending 21 miles in a N.W. and S.E. direction, or from 1° 41′ to 2° S., the longitude being 153° 28′. The ship crossed the middle of this reef and the coral rocks beneath were plainly seen, the depth being estimated at 4 or 5 fathoms, but Capt. Fradin could not see it in the assigned position in December, 1861.

Dampier Islands.—Some islands were seen by Dampier, March 2, 1699. He does not give any detailed account of them, but states that to the N.E. of the

larger island were two others, one small but woody, the other a league long, inhabited, and full of cocoa-nut trees. There is much doubt as to their position off the coast of New Ireland. They may be the same as Kaan Islands, previously described.

Gardner Island, perhaps *Suzannet Island* of Bougainville, extends from 151° 52′ E. to 152° 4′ E., and from 2° 45′ to 3° 4′ S. According to Captain Hunter it is narrow, about 2,000 ft. high, and rugged; it is curved to the S.E., and in the concavity on the eastern side are several low islands, perhaps affording anchorage. A narrow strip of green water extends a mile to the eastward of the S.E. point.

Fisher Island, *Vischers Island* of Le Maire and Schouten, 1616, lies to the northward of Gardner Island. When the West points are in one from the South they bear N.N.E. Its centre is in 2° 40′ S., 151° 58′ E., with a very narrow channel between it and Gardner Island. The island is small, about 980 ft. high, and level in appearance. Capt. Hamilton, S.S. *Mikado*, communicated with the natives in 1876, and found them friendly.

There is a *bank*, with some shoal spots on it, at 4 miles West from the middle of Vischer Island. When at anchor in 16 fathoms the North point of Gardner Island bore S.E. ¼ E., 3½ miles; the western point, South, 6 miles; and the N.W. end of Vischer Island, N.E. by E. ¾ E., 2½ miles. There is a shoal of 4¾ fathoms and apparently less, bearing N.W. by W., a quarter of a mile from the above anchorage, and another spot of 7 fathoms or less, bearing S.E. by E. half a mile.—*Capt. Hunter.*

The Coast of New Ireland at this part is high and mountainous, as before stated, and covered with fine trees. The sides of the hills are cleared and cultivated in many parts, and this with numerous smokes indicate a dense population.

Slinger's Bay is in this part; it is a point where Dampier, seeking anchorage, was deterred by the hostile appearance of the natives, who, on his returning, attacked him by slinging stones. In long. 151° 2′ E. is *Kapsu*; anchorage may be obtained here in 13 fathoms, opposite the German trading station.

St. Matthias Island was discovered by Dampier, who took it to be Tasman's Vischers Island. Lieut. Ball also saw it, and called it *Prince William Henry Island.* In its centre, lat. 1° 40′ S., long. 149° 40′ E., a high mountain rises, visible 40 or 50 miles. H.M.S. *Blanche* visited the island in 1872, and Capt. Simpson describes it as diamond-shaped, about 24 miles long East and West, and about 15 miles broad from North to South; towards the southern end of the S.W. side are a number of coral reefs and islands. No anchorage was found, there being no soundings outside the reefs, and no passage was found into any of the lagoons; the vessel was consequently obliged to leave without communicating with the natives, who were most anxious to trade. This island is reported to lie 6 miles West of the above position, and to have some islets off its North side.

About 12 miles to the East of the S.E. part of St. Matthias Island is a small, low island, with two slightly undulating hills higher than coral islands. Its centre is in about lat. 1° 41′ S., long. 150° 6′ E.

Squally (Tasman) or *Kerué Island* (Bougainville) is described by Lieut. Ball as a low island of the flat coral description, covered with wood, and, as Capt. Hunter thought, without inhabitants. It lies about 27 miles eastward of the last, or in lat. 1° 40′ S., long. 150° 30′ E. As seen from the N.W. its northern end appears saddle-shaped.

"Squally Island I found only to be about 2 miles square, instead of 15 long and 3 broad, as it is in the charts I have; it is low, but covered with trees of a good height. Some canoes came off with about 40 men in them, and we saw about 150 more inhabitants on the shore."—*Capt. Ross*, S.S. *Benledi*, 1879.

North Cape or *Cape Byron*, the N.W. extremity of New Ireland, was named Byron by Carteret, September 12, 1767, and is a low promontory, covered with cocoa-nut trees. To the S.W. of the cape is Nusa Island, between which and the coast is a nearly landlocked harbour of about 1 mile in diameter, having good anchorage in 7 fathoms. The entrance from the northward has a bar, upon which 18 ft. was obtained, but the southern entrance is stated to be deep enough to admit large ships. The tidal streams run strongly between the islands and the coast in this neighbourhood, the ebb running to the southward 2 knots per hour.—*Annalen der Hydrographie*, 1882.

Carteret determined the separation between New Ireland and New Hanover, calling the channel *Byron Strait*. He says there are several small islands in it, upon one of which is a remarkable sugar-loaf peak, about 650 ft. high, to which he gave the name of *Byron Island;* D'Entrecasteaux calls it *Mausolée Island*, and says the channel is filled with islets and rocks.

The officers of the *Gazelle* partly examined this strait, and found it was split into two by *Mausoleum Island*. There is no ship passage through *Byron Strait*, to the West, but *Steffen Strait*, to the East, is said to be clear of reefs, except one of 4 fathoms lying in the southern entrance. Steffen Strait lies North and South, is from 1 to 2 miles wide, and bordered on both sides with reefs and islands; the entrance from the South is easy to find, lying midway between Mausoleum Island and Cape Jeschke. No bottom was found in it at 22 fathoms.

NEW HANOVER, the island to the westward, so called by Carteret, is about 37 miles in length, East and West, by about 20 miles in breadth, and consists of a mountainous ridge averaging in height from about 1,000 to 2,000 ft. Towards the eastern end this ridge separates into several branches. Carteret stated it to be high, and finely covered with trees, the whole having a beautiful appearance. The West point was called *Queen Charlotte's Foreland*, in honour of the queen. The N.E. coast of the island is still very imperfectly known.

Off the North coast of New Hanover lie *East Islands*, a group of four

islands lying on one reef. Between these and *Cape Solomon Sweert* (so named by Carteret, August 5th, 1643, after a member of the Council of the Indies) is a wide bay, in which H.M.S. *Conflict* anchored in 18 fathoms, 2 (?) miles S.W. by W. from the North extreme of the large island. Cape Solomon Sweert is low and has two islands off it, and from thence to the westward the shore is fronted by a barrier reef, reaching 2 or 3 miles off, with several islands on it. In long. 150° 5′ E. is a deep channel through this reef to the coast. Many villages were seen in this vicinity.

Cape Queen Charlotte, in lat. 2° 28′ S., long. 149° 55′ E., is low, and the land in the vicinity is remarkable for numerous small hummocks. Close southward of it is *West Islet*.

North Haven, on the North side of the cape, was visited by H.M.S. *Blanche* in 1872. It is formed by an off-lying coral reef, affording sheltered anchorage in a space 2 miles long N.E. and S.W. by 6 cables broad, with 13 to 18 fathoms water over fine sand. The western entrance is the best, as there are several shoal patches in the eastern one. In entering keep within a ship's length of the S.W. end of the outer reef, as the water on the South side shoals to 3 fathoms in parts. Landing is difficult, on account of the shore reef. The scenery here is described as very beautiful.

At the time of the visit of H.M.S. *Blanche*, the natives appeared never before to have been visited by white men; they were arrant thieves, but good humoured. No fresh water or supplies were obtainable; hoop iron is much valued here.

It is high water, on full and change, at about $2^h\ 30^m$; rise about 3 feet.

Portland Islands, about 10 miles S.W. by W. ½ W. of Cape Queen Charlotte, which are alluded to by Tasman, were thus named by Carteret. They consist of four small low wooded islands, extending N.E. and S.W. on a narrow coral reef; from the S.W. island the reef stretches about 2 or 3 miles to the West or S.W. Landing may be effected in a break of the reef at the N.E. end of the northern island. H.M.S. *Beagle* was here in 1880; the natives, estimated at about 100, appeared peaceable, and were without weapons.

"The northern islet has cocoa-nut trees on it. There are no passages between the islands, and no anchorage near them. Population estimated at 150, apparently friendly."—*Mr. E. Redlich.*

From Cape Queen Charlotte the coast trends S.E. for 3 miles to a sharp, projecting, wooded cape, called *Heuk*, 40 ft. high at its extremity; after which the coast runs in an E. by N. direction for about 3 miles, forming *Marien Bay*, a collection of small bights and coves, none of which appear to afford good anchorage. It is about 6 miles across, the land at its head trending S.E. to the northern point of Expedition and Water Bays, the latter of which affords fair, but deep anchorage, exposed to the South and westward. After this the coast projects slightly for a distance of 8 miles to *Cape Batsch*, and then takes

an easterly direction for about 12 miles to *Cape Werner*, the South point of the island. Cape Werner is well wooded, and terminates somewhat abruptly, and at 12 miles N.W. ¼ N. from it is *Cape Klatt*, the eastern extremity of New Hanover.

Mount Stosch, 1,312 ft. high, north-westward of Cape Batsch, when bearing E. by S. ¼ S., leads up to the entrance of Water Bay.

The whole of the South coast of New Hanover appears fringed with coral reef, but seldom to the distance of as much as half a mile, with deep water close to its edge and apparently no off-lying dangers.

Sandwich Island, divided by *Gazelle Channel*, from 6 to 8 miles wide, from the South part of the West end of New Ireland, was first distinguished as an island and so named by Carteret. Admiral Hunter describes it as of moderate height, and well covered with wood. Its South coast was examined by Lieut. de Hoghton, H.M.S. *Beagle*, 1880.

Sandwich Island is triangular in shape, its northern and southern sides being about 12 miles long, and its western coast 5½ miles. Its average height is from 180 to 250 ft., but near the northern end is *Mount Bendemann*, 600 ft. high, a conspicuous sugar-loaf peak. The southern shore is fringed with a coral reef, and S.W. of *Brown Point*, its eastern extremity, are Patchy and Deep Bays affording no anchorage. From *Beagle Point*, at the S.W. end, the coral reef stretches 3 miles southward, with several boulders on it. Extending to the westward of Beagle Point, which rises in two small elevations about 200 ft. high, is a detached barrier reef 6 or 7 miles in extent North and South, on the East side of which are *Redlands* and *Archway Islets*, low and close together. Cocoa-nut and bread-fruit trees were growing on the N.E. end of Redlands Islet. A channel 1½ mile wide, with numerous coral patches in it, divides this barrier reef from the reef off Beagle Point. A few natives were seen at Beagle Point; patting the top of the head with the palm of the hand appears to be a sign of friendship in this vicinity.

The South coast of the N.W. part of New Ireland is of coral formation, fringed with narrow coral reefs. From *Cape Jeschke*, eastward, there is no anchoring ground for 12 miles until *Johanna Bay* is reached, and even there it is not good, as the space between the reefs is too confined. To the westward of Johanna Bay is *Dietert Peak*, 722 ft. high; this, with Mount Bendemann on Sandwich Island, well marking the western entrance of Gazelle Channel. The channel appears to be deep and clear of dangers.

Holz Haven or *Wood Harbour*, the observation spot on the East side of which is lat. 2° 47½′ S., long. 150° 57½′ E., is about 4 cables in length in a northerly direction, by 2 cables wide. The entrance is narrowed by coral reef to a cable's width, and the best anchorage is in about 15 fathoms about 1½ cable North of it. In entering it is necessary to make allowance for the current, which appears to set East and West, directly on to the reefs. Mount

Bendemann bearing S.W. ½ S. astern will lead up to the entrance. It is high water, on full and change, at about 2h 50m; the rise being about 3½ feet.

Anchorage may be found at *Dorf Harbour*, 4½ miles S.E. of Wood Harbour; the depth varies from 30 to 9 fathoms, but the space is so limited that it is requisite to moor. A small river flows into the sea near this anchorage, affording good water. There are numerous villages here, but the natives are not to be trusted. No supplies can be obtained.

Angriffs or *Attack Island* lies about 8 miles S.E. of Dorf Harbour, and is so named from an attack upon a boat of the *Gazelle*. It is connected to the mainland by coral reef. It is possible to anchor, but close in on the South side of the reef. From Attack Island the coast trends S.E. by E. ½ E. for about 58 miles to *Cape Strauch*, and is slightly indented with several small inlets, of which Katherine Bay is the most important. Towards this bay the mountain range, which so far has been uniform in aspect, changes its outlines, and branches off into numerous chains of hills and spurs, which appear more cultivated. Watercourses are now seen between the hills, and where they discharge themselves into the sea, villages are often seen, which, with sand beaches and palm trees, make a pretty landscape. The natives constantly offered fruit and vegetables in barter.

Katherine Bay lies between Ahlefeld and Wachenhusen Points, and is composed of a series of slight indentations in the coast, which, viewed as a whole, form a shallow curve, scarcely deserving the name of a bay. *Katherine Harbour* is one of these small bights about 3 cables across by the same in depth, and having indifferent anchorage in about 27 fathoms, exposed to the southward and westward. Two small wooded rocks lie to the southward of it. Observations on the beach of the N.E. part placed it in lat. 3° 11′ S., long. 151° 35′ E. The best anchorage is in about 22 fathoms, rather nearer to the East side.

From Cape Strauch the coast trends E.S.E. for about 22 miles to *Cape Givry*, and is indented with many small inlets. From hence to *Hunter Point*, 55 miles S.E. by S. ½ S., the coast appears to form a deep bay, at the head of which is *Cape Rossel*, with high land within it. There is a good supply of fresh water at Cape Rossel. The natives appear to be friendly.

At *Kuramut*, about midway between Capes Givry and Rossel, Mr. G. Brown started on his trip across to the North coast, which was found to be about 15 miles distant. The country was found to be well populated. About 5 miles from Kuramut is a small island, the coast in the vicinity of which is said to be the only place in the South Seas where any true chalk is found.

ST. GEORGE'S CHANNEL separates New Ireland from New Britain; its true character was first determined by Carteret, in September, 1767. It is 13 miles wide in its narrowest part between Hunter and Perara Points, and would appear to offer a safe and convenient passage for ships passing to the North or

South. The New Ireland side may be approached within a short distance, but there are reefs on the New Britain side, extending about a mile from the shore.

In 1878, volcanic eruptions occurred in this neighbourhood, and the German S.S. *Pacific* experienced difficulty in proceeding through St. George's Channel a few days after the eruption, as fields of pumice stone covered the surface of the sea. Caution is therefore necessary in navigating it. The passage between Duke of York Islands and Blanche Bay had been closed by a compact field of pumice stone 5 ft. in thickness.

In the Duke of York group and vicinity, the S.E. trade wind generally sets in about the end of June, accompanied by heavy squalls and rain. Light breezes commence about 8 a.m., and freshen towards noon, and, as a rule, die away towards sunset.

If the S.E. wind shifts to the northward, rain may be expected. It generally finishes about the end of September and from that time until December, when the N.W. monsoon generally commences, variable winds may be expected. In the early part of the N.W. monsoon, December and January, the weather is generally squally with rain, February and March being fine weather, and from March until the S.E. trade commences, the winds are light and variable. The barometer rises for easting in the wind, falls for southing; and remains steady with wind at S.E. The compass of H.M.S. *Danae* was considerably affected when passing the S.E. end of New Ireland and Bougainville Island.

In the vicinity of New Hanover, New Ireland, and New Britain, the S.E. trade appears to be deflected by the high land, and to blow principally along the coasts.

The prevailing current appears to set to the southward, but it is much affected by the monsoons. Along the S.W. coasts of New Hanover and New Ireland, the current was found generally setting W.N.W., from a half to 1¼ knot an hour. Vessels proceeding South during the S.E. trade, are recommended to keep close to the New Britain coast, thereby taking advantage of an eddy current setting to the southward, and by making short tacks avoid the current in mid-channel. Wide Bay should be avoided, as the current appears to set strongly into it. The currents are stronger on the East than on the West side of the Duke of York group. East of it, the strength is about 2 to 3 knots per hour, and at times probably still stronger. There is only one tide in the 24 hours, and that is irregular.

Duke of York Islands consist of a group of 13 islands on the South side of St. George's Channel, Duke of York, Ulu, and Mocodà or Makada, being the principal ones. *The natives* are friendly, but they are cannibals, according to their own confession. Fish, pigs, and fowls can be procured from them, but vegetable produce is scarce.

Duke of York Islands, or *Amacata*, were discovered and named by Carteret. He describes them as level, and having a delightful appearance. Capt. Hunter gives a long account of the islands and inhabitants. They were surveyed by

Lieut. Richards, H.M.S. *Renard*, in 1879, and the following description is chiefly taken from his report and those of officers of other of H.M. ships.

All the islands have shore or fringing reefs, but these rarely extend for more than 100 yards from the beach; whilst on many parts of the large island the water is quite deep to within a few feet of the cliffs. In Port Hunter the largest vessel might be moored in smooth water so close to the reef, that a short plank alone would be necessary to enable any one to pass from the ship to the shore.—*Mr. G. Brown.**

All the group, with the exception of Makada, are low, thickly wooded, and slightly cultivated. Ulu is the only one uninhabited, probably on account of its being considered unhealthy by the natives. There are three harbours in the group, Makada, Meoko, and Port Hunter. Port Hunter is not to be recommended, on account of its great depth, scarcity of fresh water, and also the difficulty generally experienced in entering and leaving. Makada is the best place for watering, but Meoko affords the best holding ground, and the most sheltered anchorage.

Port Hunter, the bay in which Capt. Hunter anchored, is on the N.W. part of Duke of York Island, and was found to be convenient and safe at that season (May, 1791). There is anchorage in any part of it, in 25 to 15 fathoms, sheltered from all winds but those between N.N.E. and N.W.; the shoalest water has the worst ground. The tide rises 5 or 6 ft. It is difficult to recognise at night, as there are two or three bays on this side of the island. Little or no water can be obtained, and but few fresh provisions. There was a Wesleyan missionary station here in 1877.

Makada Harbour, or *Port Ferguson*, situated between Duke of York Island and Makada Island to the westward of it, is an excellent harbour for small vessels, and can be entered either from North or South. The two northern entrances lie between the two islands N.W. of Port Hunter. The channel between Maiil Island and the coast is about 1½ cable broad, with 18 ft. water; the current sets strongly through it, and it is recommended to use the 8-fathoms channel between Maiil and Bradley Islands in preference. Keep nearer to Bradley Island as a fringe reef extends nearly to the centre of the passage from the eastern islet. The flood tide sets across the entrance, towards Bradley Island. Numerous reefs render the passage westward of these islets unsafe. Inside the depth varies from 2½ to 7 fathoms.

Vessels entering from the northward should keep near the Duke of York Island shore, where the deep-water channel follows the bend of the land, thus avoiding the shallow water to the northward of Makada Island.

The southern entrance is broader, but there are several reefs lying in its

* From an interesting paper entitled "Notes on the Duke of York Group, New Britain, and New Ireland," in the "Proceedings of the Royal Geographical Society," vol. xlvii., 1877, pp. 137-150.

entrance. H.M.S. *Beagle*, 1882, struck on a sunken rock lying 1½ mile S. by E. ¼ E. of the West point of Makada Island. Some sunken patches of 3 to 4 fathoms are said to lie westward of this rock. In entering, the sand-spit at the East end of Makada bearing N.E., appears to lead clear of the outer dangers. The usual anchorage is in 4 fathoms, sand, about 1¼ cable from the beach, and eastward of Spit Point. There are two shoal patches of 2½ to 3 fathoms southward of Spit Point. Good water can be obtained from a stream a mile westward of Spit Point; it has to be carried over the reef.

In Makada Harbour the flood runs about 7 hours to the northward, and the ebb 3½ to the southward, at the rate of 1 to 3 knots an hour; rise and fall 3 to 4 ft.

Southward of Makada Harbour, *Foul Bay* opens out, in which anchorage may be had in from 5 to 10 fathoms, sand and coral bottom, half a mile from the shore, but caution should be used in entering it. At its South end is a passage leading to Meoko Harbour. Immediately southward of this bay lie the remaining islands of the cluster, protected from S.W. winds by a barrier reef.

Meoko Harbour, also known as *Port Wesley*, is the best in the Duke of York group, being well sheltered, with good holding ground, and easy of egress or ingress. It is formed by Duke of York Island to the northward, and the islands of Ulu, Outan, and Meoko to the westward and southward. It has two entrances, rendering ingress and egress easy in either monsoon.

During the S.E. trade, the N.W. entrance, between Ulu Island and Duke of York Island, should not be attempted by vessels entering, as it is impossible to beat against the current, then setting to the northward. Vessels using the N.W. passage must pass between the North end of Ulu Island and the island (100 feet high) in the passage, taking care to avoid a small reef of rocks extending S.E. from the latter island.

In entering by the eastern passage, pass within one cable's length South of the small island, lying in the entrance, thereby avoiding a 2-fathoms shoal; this passage, however, has been reported to be only 30 yards wide. As soon as the shoal is passed, steer for, and anchor off the trader's house on the West side of Meoko Island, in 5½ fathoms, white sand. This is considered the best anchorage, but there is good holding ground anywhere. The only danger in the harbour is the reef in the centre, which dries at spring tides.

Carteret Harbour is on the eastern side of St. George's Channel, towards the S.E. end of New Ireland. It is formed by two islands and the main; the largest, which is to the N.W., was called *Cocoa-nut Island*, and the other to the S.E. was called *Leigh Island*. The channel is here 23 miles wide. Between the two islands is shoal water, and each of them forms an entrance into the harbour; the S.E. or weather entrance is formed by Leigh Island, between it and a rock above water, named *Booby Rock*, which has deep water around it. According to Sir E. Belcher, the passage between Booby Rock and the main

is unsafe. The N.W. or lee entrance is formed by Cocoa-nut Island, and this is the best, because there is good anchorage in it, the water in the other being too deep. At the S.E. end of the harbour is *Port Sulphur*, a large cove, secure from all winds, and fit to haul a ship into. In the N.W. part of the harbour is *Watering Bay*, another cove, from which very good water was procured; this, too, is fit to haul a ship into, and is very convenient to wood and water in; she may lie in from 30 to 5 fathoms, soft muddy bottom. The harbour runs about S.E. by S. and N.W. by N., and is about 3 miles long and 4 cables broad. D'Urville watered here, and began his examination of New Britain opposite to it. It was also examined by Sir E. Belcher, in the *Sulphur*. The N.E. point of Cocoa-nut Island is in lat. 4° 41½′ S., long. 152° 42′.

The watering place in Port Sulphur was found to be dry at the time of the *Gazelle's* visit. Plenty of water can be obtained in Watering Bay. Some wood for fuel can be found on the small peninsula, at the southern entrance of the harbour. The native town of Port Carteret is on Cocoa-nut Island; the natives not to be depended on, but small supplies of pigs, fowls, yams, &c., were obtained in exchange for iron and tobacco.

Gower Harbour, or *Port Praslin*, is about 8 miles to the S.E. of Carteret Harbour. The first name was given to it by Carteret, the discoverer; the second by Bougainville, who anchored here, and observed an eclipse of the sun, July 13, 1768. It is sheltered by a larger island, *Wallis*, or *Marteaux Island*, and a smaller, *Green Island*, lying close to the South of it.

Capt. R. L. Hunter says that a ship being in the neighbourhood of New Ireland or the Solomon Islands, and in want of water, firewood, or spars, cannot obtain these with greater facility or safety than in Gower Harbour. The southern entrance to this harbour is about 2 miles from Cape St. George; either entrance will, however, be easily seen by a ship at a moderate distance in the offing. There is water in all the coves, but the northernmost has the finest stream. The most expeditious method is to drop anchor in 16 or 18 fathoms, then run a line to the shore, and haul your stern in. There is anchorage also on the North side of the East point of Wallis Island, in 28 or 30 fathoms, about 40 yards from the shore.

There is but one tide in the 24 hours, with about 3 or 4 feet rise and fall. The stream in the gut did not exceed 1½ knot while we were there.

Comparing Gower Harbour with Port Carteret, Sir Edw. Belcher prefers the latter, having surveyed them both in 1840 :—" Having examined the range comprehending Ports Carteret and Gower, I should certainly on any future visit prefer what in our survey I have designated *Port Sulphur*, in Port Carteret, as that under every circumstance the best adapted for wooding and watering, ingress under canvas, and affording, what is most important, convenient depth for anchorage.

" In Gower Harbour the depth is not only inconvenient, being 30 fathoms, but there is great liability to drag off the bank. In English Cove the swell

sets in so heavily at times that it may be difficult or impossible to tow, and watering is not so convenient as in Sulphur Bay.

"For a temporary supply without intending to anchor, the stream at the southern bay in Gower Harbour will be found most convenient, as a vessel might drop towards the passage through Gower Harbour, and pass out by Turtle Bay. The anchorage in Turtle Bay is bad, by reason of the rocky bottom, as well as great depth."

ADMIRALTY ISLANDS.

This group, still imperfectly known, was discovered by Le Maire and Schouten, in July, 1616; they merely sailed past them to the southward, and called them the *Twenty-three Islands*. H.M.S. *Alacrity* was here in 1874, and H.M.S. *Challenger* in 1875; from these visits we gain some recent information.

It consists of one large island, with numerous smaller ones around it. The inhabitants are not very black; their physiognomy is agreeable, and differs but little from that of Europeans. The men wear a shell, the *bulla ovum*, and some wear a cloth round the loins; with this exception they are entirely naked. The women only have a garment round the waist. Their hair is curly, and of a black colour. They sometimes redden it with ochre mixed with oil; some parts of the body are thus painted, and especially the face.

During the *Challenger's* visit they were civil and well disposed; they offered no objection to landing or exploring any part of the islands, although at first they showed some antipathy to the men visiting their villages. Their only weapons appeared to consist of spears and knives, both of obsidian, which they readily part with; tortoise-shell, armlets, spears, large wooden bowls, and cocos, were also exchanged for old iron hoop, gaudy-coloured pocket-handkerchiefs, knives, hatchets, &c. Fighting is probably rare amongst them, as none of them had scars. Their principal food appears to be sago; there is a species of bread-fruit tree on the islands. They have also plaintains and cocoa-nut trees, and cocos and yams. The only animals in their possession at the time of the *Challenger's* visit were dogs and pigs, and of these only a few. On Suhm Island one male and four female goats were landed. The canoes used at this group are 40 to 50 ft. in length.

The *Challenger* arrived at Nares Harbour on March 3rd, and left on March 10th, 1875. During this period the wind prevailed from the northward, with damp and oppressive atmosphere.

ADMIRALTY ISLAND was first briefly described by D'Entrecasteaux in 1792. It was afterwards visited by Commander Cheyne in 1862; but the most complete account of the island we obtain from the visit of H.M.S. *Challenger* in 1874. The island is about 50 miles long East and West, and

with a pretty even breadth of 15 miles. It is mountainous, rising near the central part to a height of about 3,000 ft.

Between the two promontories upon the N.E. extreme of Admiralty Island is a harbour, the entrance to which is close to the shore upon the northern side; it has, however, only 18 ft. water in the entrance.

On the South side of the peninsula at the N.E. extremity of Admiralty Island is *Bird Islet*, small, but moderately high, lying on the North side of the entrance to a small bay sheltered by reefs. The entrance, a quarter of a mile wide, has three sunken reefs lying off it: one lies S.E. a mile from Bird Islet, another three-quarters of a mile S.E. from the first, and the third S.S.E. 2 miles from Bird Islet. The anchorage, in 25 fathoms, with Bird Islet bearing N.E., is small, but protected on all sides.

Vessels entering, should do so before noon, when the reefs are more easily discerned. The fringing reef of Bird Island should be kept aboard until the reef in the centre of the entrance is made out, the passage northward of which is to be preferred. The anchorage is in the southern part of the port, in from 15 to 20 fathoms, where there is room for several vessels; here a small river empties itself, giving a muddy appearance to the water. The Imperial German vessel *Habicht* anchored in 17 fathoms, and was sheltered from wind and swell with Bird Island bearing E. ½ N., and the South entrance point S.E.

From the bay the coast, skirted by a reef 1 to 2 miles broad, trends to the S.S.W. 7 miles to *Sanders Point*, the S.E. extremity of Admiralty Island. The point is low, and may be recognized by a village built on stakes, and by two islets about 2 miles to the S.E. of the point, named *Dover Islets*.

From Sanders Point a deep bay recedes to the N.N.W., full of reefs, and from the West entrance point of the bay the coast, skirted by reefs, trends W. ¾ S. 6 miles to *Hilly Point*, which is low and wooded, the termination of a range of mountains, about 3,000 ft. high; off it lies a small island, named *Green Island*, distinguished by its colour, and in 1874 thickly populated.

H.M.S. *Alacrity*, when about 5 miles to the eastward of Hilly Point, found a passage through the reefs and patches, and an anchorage in 16 fathoms, muddy bottom, 1¼ cable from shore, protected to the southward by reefs and shoals.

For a distance of 25 miles to the westward of the anchorage the sea is studded with reefs and shoals, extending about 5 miles from the shore. A passage exists inside the reefs and close to the shore until Green Islet is reached, which must be passed on its southern side. A small anchorage exists at 7 miles westward of Green Islet, close to the shore, and with Sugar-loaf Island bearing S. by W. ½ W.

Sugar-loaf Island, situated 13 miles to the southward of Admiralty Island, is about 800 ft. high, and 4 or 5 miles in circumference, having four small hilly islands to the North and N.E. of it.

South-West Point, 25 miles W. ½ S. of Green Islet, is moderately high and thickly wooded. From it the coast, with reefs extending 1½ or 2 miles off it, trends to the north-westward 4 miles to *Alacrity Point*, at half a mile South of which is an anchorage, with three off-lying islands bearing respectively N.W. ½ N., N.W. ½ W., and W. ¼ N. The entrance to this anchorage is through the reef, and has several shoal patches in it; inside these is a dangerous small shoal of 6 ft. Several shoal patches lie between Alacrity Point and the three islands above mentioned in a distance of 8 miles.

The N.W. point of Admiralty Island is named *Wyville Point*. It lies 12 miles northward of Alacrity anchorage, the coast between forming a deep bay. Several small islands lie S.W. of Wyville Point, *Sabben Rocks*, the outermost, being distant about 22 miles; three others, named *Murray*, *Moseley*, and *Buchanan Islands*, all on the same reef, lie 6 miles W.N.W. from it. *Shallow Bay*, eastward of Wyville Point, is 4 miles wide and 3 miles deep. Three islets lie in its centre.

Western Isles, the westernmost of the Admiralty group, lie about 35 miles westward of the S.W. point, and have some cocoa-nut trees on them.

NARES HARBOUR, so named after Captain Nares, R.N., of H.M.S. *Challenger*, lies at the N.W. extremity of Admiralty Island, and is a well sheltered and convenient anchorage, easy of access, but destitute of supplies. It is nearly 8 miles in length, East and West, has an average breadth of 3 miles, and is protected by *D'Entrecasteaux Reef*, which is 7 miles long W.N.W. and E.S.E., and 6 cables in width at its broadest part. On it are three low, flat, sandy islands, named D'Entrecasteaux, Suhm, and Wild, all of which are thickly wooded; and close to its eastern extremity is a small sandy kay, with a few trees on it, named Observatory Islet, being the observation spot of the *Challenger*.

The northern or outer edge of the reef is well defined, and has apparently no outlying dangers. At 2½ miles from its western extremity there is an opening, through which, apparently, a small vessel might pass.

The southern or inner edge of the reef is not well defined; it has, as is usual with coral reefs, several mushroom rocks cropping up close to it, with deep water around, and must, therefore, be approached with caution.

D'Entrecasteaux Island, the westernmost of the three on the reef of that name, is nearly half a mile in length, and 2 cables in breadth, low and flat, but covered with trees, which, rising from 80 to 100 ft., can be seen at some distance. The village is on its North side, and the landing is on the South side. There is no good water. *Suhm Island* lies a little over a mile to the eastward of D'Entrecasteaux. It is nearly the same size and height as that island, but is uninhabited. Four cables to the eastward of it is the break in the reef before mentioned. The space to the westward of Suhm Island appeared from the masthead of the *Challenger*, when outside the reef, to be free from danger, and good anchorage will most likely be found there. The West point of D'Entrecasteaux Reef may probably be rounded at a distance of a

quarter to half a mile, and anchorage found to the southward of the reef; but it is imperatively necessary that a good look-out should be kept from aloft for any shoal heads that may exist. *Wild Island*, nearly 4 miles E.S.E. of Suhm Island, and similar to it in appearance, is three-quarters of a mile in length. The village is on its South side.

Observatory Islet, lat. 1° 55′ 10″ S., long. 146° 40′ 56″ E., small and stony, with a few trees, lies E. by N. 8 cables from the East point of Wild Island, and about a quarter of a mile inside the eastern extremity of D'Entrecasteaux Reef, which here comes to a point.

Challenger Shoal, over the West end of which the *Challenger* passed, lies E. by S. ¾ S. 1½ mile from Observatory Islet. On it there is 3½ fathoms, with apparently shoaler water to the eastward. Between it and the East extreme of D'Entrecasteaux Reef is the Eastern Channel, a safe and deep channel 1 mile broad, leading into Nares Harbour.

South Shore of the Harbour.—Moseley Point is 4 miles N.E. by E. ½ E. from Wyville Point, and 5 miles S.E. from D'Entrecasteaux Island. Between Moseley Point and D'Entrecasteaux Island are three islands, connected by a reef, named *Carpenter*, *Browne*, and *Tracey*, and nearly 1 mile E. by S. from it is a small island, named *Pigeon Island*, from the large number of pigeons which frequent it.

The whole of that part of the coast of Admiralty Island which was explored to the eastward of Moseley Point is fringed with a coral reef, which extends from 2 to 4 cables from the shore. A boat cove exists at 3 miles eastward of Moseley Point.

Failure Rocks are two small bare rocks, about 5 or 6 ft. high, on the edge of the reef which fringes the coast of Admiralty Island. They lie S.S.E. a little over 3 miles from Observatory Islet, and E. by S. ½ S. nearly 4 miles from Moseley Point, and form a good mark for entering through the East Channel. To the N.W. by N. of these rocks, at a distance of half a mile, there is a narrow breaking shoal, with 2½ to 4 fathoms on it, and 20 to 28 fathoms just outside.

The channel between Carpenter Island and Moseley Point appears, so far as explored, to be safe and deep, and the space between Carpenter, Browne, and Tracey Islands and Maclear Island is an excellent position to anchor, but it has not been examined.

Maclear Island, the summit of which is 200 ft. high, lies N. by E. ½ E. nearly 2 miles from Wyville Point, leaving a clear channel between. It is thickly wooded, nearly round in shape, 900 yards long, 750 yards in breadth, and surrounded by a coral reef, on the western edge of which are two small rocks, about 20 ft. high, named *Twin Rocks*.

Eastern Channel.—To enter the Eastern Channel, bring Failure Rocks to bear S. ¾ E., and steer in with them on that bearing until the whole of Suhm Island is open to the southward of Wild Island: the ship will be inside Haver-

gal Shoal, and should haul to the westward, and anchor as convenient in 18 to 20 fathoms, about half a mile from the shore, with the West point of Wild Island bearing from North to N.N.W.

Approaching from the eastward, Observatory Islet should on no account be brought to the westward of S.W. until Failure Rocks bear S. $\frac{3}{4}$ E., in order to clear Challenger Shoal.

Havergal Shoal, of 4 fathoms, lies S.E. by S., $6\frac{1}{2}$ cables from Observatory Islet, and other dangers may exist between it and D'Entrecasteaux Reef.

The centre of the harbour is much encumbered by a chain of coral knolls, which extends from the middle of Carpenter Island north-eastward to the edge of D'Entrecasteaux Reef. To the eastward of these shoal patches is the anchorage, 3 miles long by $1\frac{1}{2}$ mile in width, and the only dangers in it, with the exception of Havergal Shoal, are close to the edges of the reef. A considerable tidal set to East and West has been observed, with no perceptible rise or fall.

H.M.S. *Conflict* found anchorage in 3 fathoms, open to the N.W., in a bay three-quarters of a mile wide, with Observatory Island bearing N.W. by N., distant about 5 miles. A flat rock lies in the centre of the bay, and two-thirds of a mile N.W. of it is a dangerous patch awash. A small river running into the bay round a remarkable black rock, about 100 ft. high, afforded a supply of good water, easily obtained.

Boudeuse Bay is a small indentation in the North coast of Admiralty Island, 4 miles to the eastward of Nares Harbour. In it is a small village and several streams of *fresh water*, from which vessels may obtain a supply, but there is no anchorage off it in the N.W. monsoon, so that they must despatch their boats from Nares Harbour. *Balscot Bay*, 8 miles eastward of Boudeuse Bay, is reported to be a good and well sheltered anchorage.

From a position 9 miles eastward of Observatory Islet to Los Negros Islands, the coast is fronted by a barrier reef, upon which are several islands having passages to sea between them, from a half to 2 miles wide. H.M.S. *Conflict*, in working to windward between the barrier and the coast, found the channel 2 miles wide, and the dangers distinguishable. Reefs were observed to extend from all the points of the shore, and good anchorage was obtained between them in from 5 to 11 fathoms; the vessel passed out to sea between Los Negros Islands, lying off the N.E. point of Admiralty Island. They were so named by Maurelle, and are of pleasant appearance, but surrounded by reefs.

JESUS MARIA ISLAND, the *Circular Island* of D'Entrecasteaux, is tolerably large, but very dangerous to approach. It is surrounded by a reef, having still water within, and great depths off its outer edge. The western part is low, but the eastern part is 600 to 800 ft. high, well wooded, and even-topped. It does not appear to be much cultivated, and is of a disagreeable appearance. But few natives were seen, and apparently it cannot be thickly populated. The S.E. point of the island is in lat. 2° 22′, long. 147° 51′.

H.M.S. *Alacrity*, in 1874, anchored on the S.E. coast, inside a narrow opening in the reef, which lies just northward of a small islet. A sailing vessel would experience a difficulty in leaving during the prevalence of S.E. winds. A bay, which commences at 2 or 3 miles to the northward, is sheltered by a reef, through which there appears to be an opening.

On the South side of the island anchorage in 13 or 14 fathoms may be found in a bay lying a mile eastward of South-West Point. Care must be taken to avoid the shoals in the bay. A depth of 14 ft. will be found in the passage across the reef. A small islet lies off the S.W. point, whence the West coast of the islet trends to the N.E., and appears well populated. Several low islets extend for a distance of 8 miles off the N.W. point. Rounding the outermost of these islets, where *water* is to be got with difficulty, anchorage may be obtained in a small bay in 27 fathoms. N.W. Point has a village on it, and anchorage near. It is high water, on full and change, at 6 p.m., and only one tide in 24 hours.

La Vandola Island, 20 miles E. by N. ½ N. from Jesus Maria Island, is the easternmost of the Admiralty Islands; it is about 1¼ mile long, and 600 ft. in height, with a cliffy coast line upon the North side. There is a narrow fringing reef upon the southern side only, and no anchorage could be found. The natives came out in great numbers in their canoes, and were eager for barter.

Los Reyes, the northernmost in lat. 1° 59′, long. 148° 4½′, were nearly proving fatal to D'Entrecasteaux's ships, which were drifted against them by a violent current. The islands are two in number, each about 500 yards long, lying E.N.E. and W.S.W., 2 miles apart; they are low and thickly wooded, with apparently a small fringe reef off each island. Another island lies about 5 miles to the westward.

San Rafael Island, 12 ft high, lying about 7 miles N.N.E. from the western islet extending from Jesus Maria Island, is a flat island, about 3 miles long. *San Gabriel Island*, about 5 miles to the westward of San Rafael, is about 12 feet high and 6 miles long, with a fringe reef close to its southern shore. A small islet lies off its West end. In 1874 it appeared to be thickly populated.

The islands to the westward of Jesus Maria Island were examined by Lieut. Bower, H.M.S. *Danae*, in 1879, from whose report we derive the following description.

San Miguel Islands, 10 miles W.N.W. of the S.W. end of Jesus Maria Island, are low and thickly wooded. *Fedarb Islands*, 5 miles S.W. of them, with apparently foul ground between, are three in number, 100 ft. high, and thickly wooded. The easternmost has a remarkable conical peak, about 250 feet high.

St. Andrew Islands, 3½ miles S.W. of Fedarb Islands, are five in number, with a bushy islet, all thickly wooded, and 60 or 70 ft. high. *Violet Island* marks the entrance to St. Andrew Harbour. *Waikatoo Island* is the largest of the group, with a village built out into the water at its S.W. end. *Mait*

land Islands, 3½ miles S.W. of St. Andrew Islands, with foul ground between, are two in number, and 350 ft. high. The natives appear to be a finer race than the Solomon or New Britain islanders; they came off in large numbers, eager to barter their obsidian spears and other curiosities, for knives and old iron.

Violet Patch, lying N.W. by N., 4 cables from Violet Island, is a detached patch of live coral, the least water found on which was 3¼ fathoms. A small shoal was seen about 1¼ mile N.W. of Violet Island; it has probably from 3 to 5 fathoms over it.

St. Andrew Anchorage is easy of access, and tolerably well protected, with room for several vessels, protected from a heavy sea by reefs and foul ground. The centre of Berry Island, the easternmost of the group, S.E. by S. ½ S., leads up to the anchoring ground; let go in 12 fathoms on that bearing, with Waikatoo village closing behind Bull Island, W.S.W. There is also well-protected anchorage between Broadmead and Berry Islands, but as this part was only partially sounded, it should be entered with caution.

St. George Island, the former *Low Island* of the charts, is 7 miles long N.E. and S.W., and from 600 to 800 ft. high. A reef runs out three-quarters of a mile off the S.W. end, and near the end of the reef is a small sandbank always uncovered, which is a good mark. *St. Andrew Strait*, southward of St. George Island, has two shoals existing between Fedarb and St. George Islands, but they are out of a mid-channel course.

St. Patrick Island, 2½ miles S.W. of Maitland Islands, is about 600 ft. high, with a cliff like a haycock on its N.E. coast. Shoal ground extends off its N.E. end, with an islet 300 ft. high on it, about halfway to Maitland Islands. *Johnston Islands*, 11 miles N.W. by W. of St. Patrick Island, are three in number, with a bushy islet; the islands are about 70 ft. high, and thickly wooded. *Stuart Bank* is a dangerous reef, lying about 5 miles W. ½ N. from Johnston Islands; vegetation appeared to have commenced to grow on the sand kay, which is about 4 ft. above high water.

A small wooded island, about 12 miles S.S.E. from St. Patrick Island, not previously marked on the chart, was seen from the mast-head of H.M.S. *Danae*.

Capt. Abraham Bristow sailed through this part of the archipelago in the *Sir Andrew Hamond*, in February, March, and April, 1817, and discovered several islands, the account of which he gave to the late Mr. John Purdy, whose hydrographical labours are so well known.

Hayrick and *Platform*, two of these, are two small islands lying about 5 miles apart N.E. and S.W., and surrounded by a reef; between them is an isolated rock, forming part of the group. Several other islands, which have not been examined, lie to the eastward of these.

Elizabeth Island, 22 miles S.W. of the Hayrick, was also discovered by Capt. Bristow. It is inhabited, low, and well covered with trees, lying in

about lat. 2° 55′ S., long. 146° 49′ E. It is 2 miles long in a N.E. and S.W. direction; and connected with it is a surrounding reef, which has double the extent. Landing can only be effected at a single point, in the N.E. part of the island. There is anchorage on its South side. At 2 miles S.E. from this is a small island, the diameter of which is nearly a mile. There is a lagoon in the middle, and a wreck was lying on it in May, 1848.

PURDY ISLANDS are a group named after Mr. Purdy, by his friend, Capt. Bristow, February 16, 1817. *Bat Island*, the westernmost, is scarcely 2 miles long; it is covered with large trees, and has two hummocks on it, which at a distance appear like two separate islands. *Mouse* and *Mole Islands* are two small islands to the East of the preceding. They are separated by a channel, through which the *Sir Andrew Hamond* passed, and found it excellent. Mole Island, the north-westernmost of the two, is in lat. 2° 51′ S., long. 146° 15′ E.

Latent Reef is 4 miles in extent, and lies 4 miles to the West of Mouse Island. The northern part of this reef appears like a solid bed of rocks. There are two other reefs near these—one, 7 miles S.W. of Bat Island, and 19 miles West of Latent Reef; and another is stated to lie in lat. 2° 25′ S., long. 146° 22′ E.

A *strong current*, from West to East, was experienced here by Captain Bristow, in February to March.

Three dangerous shoals were stated by Capt. Horsburgh to exist 45 miles to the South of the Admiralty Islands. They are nearly in the same latitude, so that it is possible, from the necessary imperfection of the observations made as to their position, that they may be identical. Still there appear to be so many isolated dangers in the neighbourhood, that all caution is required.

Sherburne Shoal, the easternmost, discovered by Capt. J. White in the *Sherburne*, May 15, 1824, extends about 12 or 13 miles East and West, and 8 miles North and South. On its S.E. part is a dry sand-bank, and some rocks, which rise 20 ft. above the water, in another part. The S.E. part is in about lat. 3° 15′ S., long., by chronometer, 148° 16′ E.

Circular Reef, discovered by Capt. Renneck, in the *Lyra*, November 7, 1825, is 3 or 4 miles in diameter, having deep water inside, with an opening in its N.N.W. part. Lat. 3° 18′ S., long. 147° 40′ E.

To the southward of this, and much in the way of vessels passing westward from St. George's Channel, are two shoals or reefs; the northernmost, *Albert Reef*, in lat. 3° 58′ S., long. 147° 58′ E.; the other, *Victoria Reef*, in lat. 4° 17′ S., long. 148° 10′ E. They each break.

Sydney Shoal, on which the *Sydney*, Capt. Austen Forrest, was wrecked, May 20, 1806, is covered at high water, but at low tide some rocks appeared above the surface. Lat. about 3° 20′ S., long. 146° 50′ E.

Anchorite Isles.—Anachoretes Island was discovered by Bougainville, August 7, 1768, in lat. 0° 50′ S., long. 145° 30′. H.M.S. *Alacrity* visited the islands in 1874. They are described as five or six in number, occupying a space of about 2½ miles in a N.E. by N. and S.W. by S. direction; they are low, flat islands, thickly covered with cocoa-nut trees, and connected to each other by the reef. The northern island is the largest, being about half a mile long. Off the North end of the group a tide rip is caused by the strong current setting to the westward around the end of the reef. There is a boat entrance across the reef, near one of the southern small islets; the canoes came out over it through the surf. The water inside the reef appeared discoloured and shallow. No anchorage was found.

The natives somewhat resemble the Chinese in features, being of a light colour, with long, straight, black hair, which they wear closely rolled up on the top of the head. They are well-built men, but apparently cunning and treacherous.

Commerson Island.—Another low island was seen from the mast-head of Bougainville's vessel, at 8 miles distant, and named Commerson Island. It is 15 miles W. by N. from the northernmost of the Anachoretes, and in lat. 0° 40′ S., long. 145° 17′.* Capt. von Schleinitz, of the German vessel *Gazelle*, 1875, found there were two islands, covered with large trees and cocoa-nut palms; the S.W. island is the larger of the two, and nearly flat.

Two small islands were reported, in 1877, on the equator in long. 146° E.; each being about half a mile in extent, connected by a reef, uninhabited, and covered with low trees.

Boudeuse Island was named by Bougainville after his ship, August 9, 1768. It is low, and in lat. 1° 26′, long. 144° 34′ E.

L'Echiquier (the Chess-board), so named by Bougainville, consists of a large collection of islets. D'Entrecasteaux placed upwards of thirty on his chart, but states that it is probable that in the North part of it many were not seen. They are only a series of low, flat islets, covered with wood. They all appear to be connected by reefs. The South point is in lat. 1° 40′ 30″, long. 144° 3′.

This group is enclosed by a narrow reef, through which there are several passages, the one chiefly used being on the N.E. side. During the visit of the schooner *Franz*, in 1872, the number of islands of the group counted were fifty-three. The natives, amounting to about 800, are of a dark copper colour, with long stringy hair, and are frequently at war with the Hermit islanders.

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* Monks Islands (*Los Monjos*).—Four small, low islands, which extend nearly 5 miles in an East and West direction. Maurelle first saw them in 1781, and determined their position to be in lat. 0° 57′ S., long. (corrected) 145° 41′. Capt. Hunter also saw them.

The assigned position was passed over by H.M.S. *Alacrity* in 1874, without observing any sign of them from the mast-head. They must be the same as the Anchorite group. The brigantine *Coeran*, in 1874, also passed over it without observing them.

Los Eremitanos, or Hermits, were seen by Maurelle when 24 miles distant. They are described by D'Entrecasteaux as being high in the N.W part, and seemed to leave considerable intervals, but, on a closer approach, they terminate in low lands, and are enclosed in a very narrow belt of sand, within which is a large space of still water. They are inhabited; the natives came off in canoes, and apparently were friendly.

The group consists of seventeen islands, surrounded by a large reef, the exterior limits of which extend about 10 miles North and South, and 13 miles East and West, and stretch about 6 miles from the shore of the largest island. It was examined by the officers of H.M.S. *Alacrity* in 1874.

Loof Island, about 500 ft. high, lies near the centre of the group, and is the highest land in the vicinity. There are two native towns, one on Loof and one on Geloon Island. *Pémé*, the N.E. islet, is in lat. 1° 28′ 50″ S., long. 145° 5′ 45″ E.

There are five passages through the reef; the *N.W. passage*, the broadest, is about 1 mile broad, the anchorage generally used being on the North side of Loof Island. The *North passage* lies N.W. by W., 4 or 5 miles from Tet or Zet, a small island lying off the North extreme of Loof Island; this passage is narrow, with generally a confused swell setting into it.

Alacrity Anchorage, formed by the reef on the N.E. side of Hermit Islands, affords good shelter in 8 to 10 fathoms, sandy bottom; there are two passages leading into it, the northern named Coeran and the southern Sabben Passage. *Coeran Passage*, about 1½ cable wide, is separated from Sabben Passage by a reef about 400 yards in extent, to the N.N.W. of which is the anchorage; the inner part of Sabben Passage is contracted by a shoal with 3 ft. water on it. At the anchorage the only tide that is felt is for about four hours at low water, when it runs nearly 3 knots an hour in a south-westerly direction, and there appears to be only one tide in 24 hours.

It would not be advisable to attempt either of these passages under sail during the strength of the tide, without a commanding breeze, as the tide rips render it difficult to discern the reefs; and shoals may exist that have not been seen.—*Lieut. F. W. Sanders*, H.M.S. *Alacrity*.

Matty and *Durour Islands* are two small, flat islands, discovered by Carteret, September 19, 1767. According to D'Entrecasteaux the latter is in lat. 1° 33′ 40″ S., long. 143° 12′ 30″, and the other in lat. 1° 46′ 0″ S., long. 142° 56″. Carteret places them in lat. 1° 43′ 21″, long. 143° 2′ E.

Tiger Island is a discovery of Capt. Bristow in 1817, and communicated by him to Mr. Purdy. It is about 6 or 7 miles in length, East and West, and inhabited by a ferocious race of savages. Lat. 1° 45′ S., long. 142° 2′ E

CHAPTER XIX.

THE EASTERN PART OF NEW GUINEA, LOUISIADE ARCHIPELAGO, AND TORRES STRAITS.

THE EASTERN PART OF NEW GUINEA.

The south-eastern portion of New Guinea was little known until the surveys of Capt. John Moresby and Lieut. L. S. Dawson were made in the years 1873-4, in H.M.S. *Basilisk*. These surveys connect Capt. Owen Stanley's work on the South coast with that of D'Entrecasteaux on the North. Although a valuable addition to geographical knowledge, the work of Capt. Moresby seems but of little service to commerce as far as trade with the natives is concerned, or colonization. The natives have but little to barter, and the climate from all accounts appears to be most unhealthy. With the exception of a few naturalists, and some missionaries established in various parts by the London Missionary Society, but few strangers have visited the coasts. The discovery of most importance is the ship channel existing through the great Louisiade Reefs, by which vessels gain a much shorter route from Australia to China, &c., than by rounding the eastern end of the reefs.*

Within the last few years much attention has been directed to the eastern portion of this little-known part of the world, and several travellers have made expeditions into the interior, among which we may mention those of the Rev. S. Macfarlane and Signor L. M. D'Albertis up the Fly River; M. Miklukho-Maclay in the neighbourhood of Astrolabe Bay; and those of the missionaries the Revs. S. Macfarlane, W. G. Lawes, and J. Chalmers, and Messrs. O. Stone and A. Goldie, on various parts of the S.E. coast. Full particulars of these explorations will be found in several interesting papers, published in the "Proceedings of the Royal Geographical Society," for the years 1875—1884.

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* Capt. Moresby published the results of his Explorations in an interesting volume, "Discoveries and Surveys of New Guinea and the D'Entrecasteaux Islands."

An expedition is now being prepared, with Mr. Wilfred Powell at its head, to make a more thorough exploration of the interior. Mr. Powell is already well known for his explorations in New Britain, &c., and along the N.E. coast of New Guinea.

In its greatest extent W.N.W. and E.S.E. New Guinea is 1,306 miles in length, its area, including its adjacent islands, amounting to about 312,000 square miles, or equal to that of the British Isles and Spain together.

The south-eastern extension of this vast island is formed by the slopes of the *Owen Stanley Range* of mountains, which terminate at the East cape. Most of the heights of this chain of mountains are visible, in very clear weather, at a distance of 90 miles; but within 20 or 30 miles of the coast they so alter their shape as not to be easily distinguished. They are visible for the longest periods during the N.W. monsoon, and are generally capped with clouds the greater part of the other season of the year.

Natives.—The black races of New Guinea are probably divided from their lighter neighbours to the eastward somewhere about the meridian of Yule Island, long. 146° 30′ E. The natives of the S.E. parts of New Guinea and adjacent islands in appearance are copper-coloured, averaging 5 ft. 3 inches in height, of a light, active build, often with good features, which they paint; but the men's teeth and mouths are much disfigured by constant use of the betel-nut. The hair is usually worn frizzled out into a huge mop, and ornamented with feathers. The women's hair is always cut short. Both sexes go almost naked. Their weapons appear to be wooden spears and swords, clubs, slings, and stone V-shaped hatchets, but no bows and arrows were seen amongst them. Caution is requisite in dealing with these people, as they are much inclined to pilfer; in some places they are trustworthy and friendly, but it is necessary to be armed on all occasions. Occasionally, human jaw and spinal bones are worn as bracelets and ornaments. They appear to take pleasure in making it understood that they have eaten the original owners of the bones; but these, as well as the few skulls exhibited in their villages, appear to be of an ancient date.

Their plantations are very extensive, and carefully terraced on the mountain sides. Abundance of yams of the finest quality, taro, bananas, sugarcane, apples, Indian corn, and other tropical fruits, are everywhere to be found.—*Capt. Moresby, R.N.*

On April 4th, 1883, Mr. H. M. Chester, the resident magistrate at Thursday Island, hoisted the British flag at Port Moresby, and formally took possession, in the name of H.M. Queen Victoria and of the Government of Queensland, of all that portion of New Guinea and the adjacent islands, lying between the meridians of 141° and 155° E., thus including the Louisiade Archipelago.

The GULF of PAPUA is an indentation of the coast, extending 191 miles across from Cape Suckling, W. ½ S., to Bampton Island, and is about 80 miles in depth. The shores of this extensive bay are low, and with the exception of

Aird Hill and the Albert Mountains, nearly 90 miles farther to the eastward, the West and northern coasts present no objects of sufficient elevation to serve as marks for making them from seaward; the lead will therefore afford the best indication of approaching the land, especially to the westward, where sand and mud flats extend far out from the shore.

From the South point of Bampton Island to Aird River, 90 miles to the N.E. by N., not a single eminence, or scarcely a tree more elevated than its neighbours, could be seen above the level outline of this extensive and apparently half-drowned country. It is wooded to the water's edge, the tops of the trees in many parts ranging from 100 to 150 ft. in height.

The numerous fresh-water openings in this portion of the coast appear to be the delta of some vast river forming, by its deposits, a continuation of mud flats, and banks of hard, fine, black sand, extending from 6 to 25 miles off shore; the latter extent is eastward of Prince River.

From abreast Bampton Island a low, alluvial, and thickly wooded coast, with several villages near the shore, trends N. by E. ½ E. 17 miles to the South point of Fly River, off which lies *Mibu*, a low, woody island, 11 miles in circumference, separated from the shore by a narrow creek. Breakfast Point, the eastern extreme of Mibu Island, lies N. ¾ E. 16 miles from the South point of Bampton Island, *Ellangowan Rock*, a coral rock with less than 9 ft. over it, lies 4 miles E.S.E. of the North point of Bampton Island.

Fly River is a broad opening immediately to the northward, and is 5 miles wide at its mouth, where the water was found to be fresh. *Tree Isle*, which is low and wooded, is 4 miles long and 2 miles broad; it lies close off the point on the North side of Fly River, and there are villages on its northern end. Near the southern point of the island was a high, round tree, in lat. 8° 41′ S., long. 143° 37′ E. Vessels not drawing more than 14 ft. could safely enter, by taking the precaution of having a boat ahead, and carefully attending to the lead, in crossing the flats lying eastward of the entrance.

The Rev. S. Macfarlane ascended the river in the *Ellangowan*, a small steam launch drawing 6 ft. water, in December, 1875, for a distance of 150 miles. Few natives were seen beyond 100 miles from the mouth. Two villages lie on the East point of entrance. At 40 miles above the entrance is an opening leading out from the left bank of the river, which probably forms another mouth on the coast to the northward.

In 1876, Signor D'Albertis, who had accompanied Mr. Macfarlane in the *Ellangowan*, ascended the river in the steam launch *Neva*, drawing 3½ to 4 ft., for a distance of over 500 miles, when he was compelled to return. In 1877 he again ascended to a distance of 475 miles. In both journeys he had much trouble with his crew and the hostile natives. The river flows through a flat, swampy, and unhealthy country.*

* For further information, see "Ascent of the Fly River," by the Rev. S. Macfarlane,

Prince River, in lat. 8° 8′ S., is an entrance 1½ mile wide, which communicates with another channel entering the sea 7½ miles to the northward. Just to the northward of the latter entrance is a third opening, probably another entrance to Prince River. *George River*, 28 miles to the northward, appeared to be a considerable stream.

Aird River, 28 miles north-eastward of George River, was found to have a bar across its entrance, over which the greatest depth was 6 feet. Entrance Island lies in the mouth of the river, with the deepest channel on its western side. *Aird Hill*, rising in about lat. 7° 30′ S., long. 144° 22′ E., is a conspicuous mark on this monotonous coast, and rises to a height of 1,260 ft., at about 25 miles N.N.W. of Cape Blackwood, which forms the eastern entrance point of Aird River.

Deception Bay is an extensive bight in the low country, immediately to the eastward of Cape Blackwood. It is 20 miles wide E.N.E. and W.S.W. between the cape and Bald Head, and 9 miles deep. This bay received its name from at first presenting every appearance of a good deep entrance to some large navigable river; but, after a very careful examination, no channel could be found through the shallows into either of the openings, which are evidently the mouths of some considerable river.

Between Bald Head and Maclatchie Point, which lies 40 miles to the E. by S., the coast is low, and has many openings in it. *West Entrance Islet*, 12 miles eastward of Bald Head, is small and woody, and marks one of these entrances. A similar islet lies 10½ miles to the eastward, marking another opening. About Maclatchie Point the coast becomes less monotonous, and several hills appear near the sea. The *Albert Mountains*, which are visible 60 miles off in clear weather, form a range 24 miles long, in a N.W. and S.E. direction, at 30 miles eastward of the point. *Freshwater Bay* lies southward of the eastern end of Albert Mountains, and a river enters it, which must be of great size, as fresh water is found on the surface of the sea, at 2 or 3 miles off its mouth. Vessels have filled their tanks from the water on the surface.

Cape Possession, in lat. 8° 35′ 40″ S., is a bold cliffy point, the termination of the steep coast range, which thence trends 14 miles to the northward. A large population is found on this part of the coast. *Mount Yule*, N.E. ¼ N., 31 miles from Cape Possession, and in lat. 8° 14′ 30″ S., long. 146° 46′ E., is a very remarkable table-topped mountain, 10,046 ft. high.

Hall Sound, or *Robert Hall Sound*.—*Yule Island*, 4 miles long and 1½ mile broad, in lat. 8° 49′ S., lies off the entrance of Hall Sound. It has several peaks on it, the highest, at the S.E. end, rising to 534 ft. The West shore may be approached to 1½ mile. The natives of Yule Island are numerous.

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and "Remarks on the Natives and Products of the Fly River," by Signor L. M. D'Albertis, Journal of the Royal Geographical Society, 1876; and "Journeys up the Fly River, &c.," by Signor D'Albertis, in the Proceedings of the same Society, January, 1879, pp. 4-15.

They crowded on board the *Basilisk*, and were friendly when their villages were visited. There is a Mission station here.

Between the North end of Yule Island and the mainland there is no passage, but good anchorage, sheltered from the S.E., was found by the *Basilisk* under the North point of Yule Island in 6½ fathoms. The southern entrance has a good channel about three-quarters of a mile wide, but care must be taken to keep a mid-channel course, for extensive reefs extend from both the mainland and Yule Island. In mid-channel the *Basilisk* found an average depth of 13 fathoms leading into Hall Sound, where sheltered anchorage under the lee of Yule Island or elsewhere may be found, the lead giving ample warning of too near approach to the mud banks which occupy the northern and eastern sides of the sound. But warning by the lead is not given in approaching Yule Island reef, the edge of which is patchy and dangerous. The channel is always discoloured by the quantity of fresh water escaping from Hall Sound.

Ethel River discharges itself over an extensive mud flat into the N.E. part of Hall Sound. At high water it is probable a channel of 9 ft. would be found. After entering the river a depth of 9 ft. and a width of about 120 yards was found, with a slight current.

Hilda River, a rapid powerful stream, running from the N.E. with too strong a current for a boat to stem, falls into Ethel River 1½ mile from the entrance of the latter. Above Hilda River, Ethel River assumes the character of a sluggish stream. It was examined for about 10 miles.

Cape Suckling is a low woody projection, S. by E. ½ E., 10 miles from Yule Island, the intermediate coast being of the same aspect, and backed by ridges of hills, between 700 and 800 ft. high. Two of the southernmost hills of the range form the only feature by which the cape may be recognized. There is a coral shoal W. ¾ N. 8 miles from Cape Suckling, with 8 fathoms upon it, which appears to be the north-westernmost extremity of the Great Barrier Reef.

The GREAT BARRIER REEF, extending along nearly all the coast of New Guinea, from Cape Suckling to South Cape, and along the southern and eastern sides of the Louisiade Archipelago, is somewhat similar to that off the East coast of Australia, but not so uniform, probably owing to the immense bodies of fresh water which flow into the sea upon this coast, and which is well known to be destructive to the growth of coral. Simultaneously with the appearance of this guarding reef the entire features of the country change, precipitous, round-topped, grassy hills, openly timbered, and bearing a strong family likeness to each other, springing from the white coral and sandy beach. These hills are backed by higher ranges inland. Fertile valleys lie between, and the coast is strewn with villages, always marked by a grove of cocoa-nut trees. From Redscar Head to Hood Point not a single stream was seen emptying itself into the sea.

In many parts vessels can navigate within the barrier reefs off the coast of

New Guinea, but the channel is usually much obstructed by numerous detached reefs.

Redscar Head is a remarkable projection of the mainland, S.E. ¾ E., 26 miles from Cape Suckling, rising abruptly, like an island, from a low woody point. It is 565 ft. high, and conspicuous from the cliffs, which form its southern face, being red and white. There is a boat passage behind it, connecting Redscar and Caution Bays. *Pariwara Islets* are small and two in number, with some rocks, lying from 1½ to 2 miles north-westward of Redscar Head. *Redscar Hill*, E.N.E. 2½ miles from Redscar Head, is isolated, and rises abruptly to the height of 575 ft.

Redscar Bay, between Cape Suckling and Redscar Head, is about 20 miles wide, and 6 miles in depth. Its shores are low, swampy, and malarious, and are intersected by five openings, apparently the mouths of streams, the largest of which, 8½ miles northward of Redscar Head, lies near the head of the bay, and is named *Manumanu*, *Usborne*, or *Lalokie*. A Mission station was established at its mouth. At W. ¾ N. 5 miles from this opening are Skittle Rocks, conspicuous from seaward, from their standing higher than the low land behind them. A coral shoal, with 4 fathoms on it, lies 2 miles off shore, near the N.W. end of the bay, and W. ½ N. 8 miles from Skittle Rocks. But, with this exception, the water appeared to shoal regularly to within 2 miles of the land, the soundings all over the bay ranging from 9 to 28 fathoms, on a muddy bottom. In fine weather a vessel may anchor in any part of Redscar Bay, and the holding ground is good, but it does not afford protection from the swell of either monsoon.

Redscar Bay was visited by the Rev. W. W. Gill, of the London Missionary Society, in November, 1872, and some teachers were left at this unhealthy spot. At that time the eight villages surrounding the bay were estimated to contain 4,000 or 5,000 inhabitants.

Mr. Gill proceeded some distance up the Manumanu River, finding but a scanty population on its banks, which are overflowed at times. The village of Manumanu lies 8 miles up the river. A sand-bank, with 2 fathoms water over it, lies at the entrance, which may be known by the rush of discoloured water. A vessel of light draught could probably ascend to the village. This district has been explored by the missionaries of late years, and the river appears to take its rise from several streams, the sources of which lie between Mount Owen Stanley and Mount Astrolabe, that reaching nearly to the foot of Mount Owen Stanley being named the *Goldie*, after Mr. A. Goldie.

In the North part of the bay is the mouth of the *Aroa*, or *Toutou River*, around which are extensive mangrove and sago-palm swamps; but higher up the country is well cultivated.

Aplin Isle, S. ½ W. 9 miles from Redscar Head, is low, uninhabited, and covered with scrub. It is situated on the N.W. extremity of the visible Barrier Reef. At 3 miles eastward of it is a cliffy islet. There is very good anchorage

in 14 fathoms, at half a mile north-eastward of the island, with smooth water in the S.E. monsoon.

A dangerous coral patch, with 2½ fathoms water upon it, lies S.W. by W. ½ W. 8 miles from Redscar Head. Between this patch and Aplin Isle are some other shoals. These appear to form part of the sunken barrier, extending from 8 miles W. ¾ N. of Cape Suckling to Aplin Isle, following the general direction of the coast. A reef with 2 fathoms over it lies 4 miles S. ½ E. from Redscar Head, in *Caution Bay*, in which there are many other dangerous reefs and patches.

Fishermen Isles are a low, flat, sandy group, covered with trees; the largest island lies 3 miles S.W. by W. from *Palli Palli Point*, a steep, rocky point sloping down from a hill. These islands were so named from some of the canoes, which came off to H.M.S. *Bramble*, having in them seines of considerable length, with floats of some light wood, and sinkers, fitted like English nets of the same description.

The Barrier Reef trends S.E. by E. ½ E. from Aplin Isle, touching the southernmost of the Fishermen Isles, and from thence extends eastward to the entrance of Port Moresby.

PORT MORESBY and FAIRFAX HARBOUR.—At 2½ miles eastward of the Fishermen Isles is *Basilisk Pass*, an entrance through the outer reef, reported clear, and three-quarters of a mile wide. The reef on either side of the entrance breaks. At 3 miles northward of this entrance is Paga Point, forming the eastern entrance point of Port Moresby, called by the natives *Anuapata*. The western entrance point, Palli Palli Point, lies 1½ mile westward of Paga Point, and from its S.E. extremity a chain of three small islands extends for 1½ mile in a S.S.E. direction. Port Moresby, from Paga Point, extends for 3 miles to the N.N.W., with an average breadth of 1½ mile. *Jane Island*, 600 feet high, is situated at its head, and westward of Jane Island is the channel leading up to Fairfax Harbour, which is about 1½ mile across, and has anchorage in its centre in 5 fathoms. There is a Mission station here. The entrance leading from the N.W. corner of Port Moresby into the inner or Fairfax Harbour is 4 cables wide, with depths of 6 and 7 fathoms, and lies West 1 mile from the North extreme of Jane Island. A seam of plumbago runs along the eastern shores of Fairfax Harbour. The eastern side of Port Moresby is shallow, and off the western side is a shoal awash at low water, 2 cables off shore, and 6 cables S.S.W. from the S.W. extreme of Jane Island. *Conflict Reef*, awash at low water, lies 7 cables S.W. by W. ½ W. from the S.W. extreme of Ethel Island, and a shoal, also awash at low water, lies 3 cables N. by W. ½ W. from Paga Point.

At 3 miles S.E. by S. of Paga Point is *Locol Islet*, off the West side of which H.M.S. *Beagle* found anchorage in 12 fathoms, in 1879. There is much shoal water between Locol Islet and *Pyramid Point*, eastward of it.

Capt. Moresby thus describes the locality:—"Close to the Fishermen Islands

of Capt. Stanley, H.M.S. *Basilisk* passed through the Barrier Reef by one of those narrow openings peculiar to these seas, and anchored in a fine roomy harbour (now named Port Moresby and Fairfax Harbour), which our boats had previously discovered. The ship remained here some days, whilst running surveys were made, and the coast explored.

"In the neighbourhood of Port Moresby the valleys were intensely rich and tropical in their vegetation; but the hills, of which the greater part of the country consisted, were perfectly Australian: they had very poor soil, covered with large stones, scattered gum-trees, and thin grass. On some of these hills large quantities of quartz were found; some of the specimens picked up being impregnated with gold, but no trace of gold was ever discovered amongst the natives.

"We roamed over the country, and visited their villages as freely as if they were English people. If any of our fellows got lost in the bush, the natives took them to their villages, fed them, and offered every hospitality before bringing them back to the ship. Apparently they had never before seen a white man."

Port Moresby can be approached by the inshore passage from Redscar Head, but this route is only recommended for steamers or small sailing vessels. A clear deep channel also leads for about 3 miles from Basilisk Passage into the port, a depth of 12 and 10 fathoms being carried.

More full details of the surrounding country and inhabitants will be found in several papers published in the Journal of the Royal Geographical Society, as stated at the beginning of this Chapter.

Mount Owen Stanley, in lat. 8° 53′ S., long. 147° 32′ E., is the highest of Owen Stanley Range. It is remarkable for its square top, and cannot be easily mistaken, on account of its great height, 13,205 feet. A sharp ridge descends from it south-westward towards the sea; and westward of it and between it and the low land bordering the sea are two parallel ranges, about 25 miles in length in a N.W. and S.E. direction. *Mount Astrolabe*, about 10 miles eastward of Port Moresby, is a remarkable square flat-topped mountain, 3,824 ft. high.

From Basilisk Pass to Hood Point, a distance of about 50 miles, the Barrier Reef continues, with but few channels across it. The principal of these channels lies abreast Round Head, 18 miles N.W. of Hood Point. Inside the entrance, which can be clearly made out, is anchorage in 15 fathoms half a mile within the reef, on the S.E. side of the entrance. Paira Point, a red cliff, marks the coast midway between Hood Point and Round Head. Numerous sunken dangers exist in the vicinity of Round Head.

Coutance Reef, about 28 miles S.S.W. from Hood Point, is a white sand or coral shoal, on which the sea breaks. It was discovered in 1804 by M.

Coutance, and was seen in 1860 by Mr. Kennedy, commander of the ship *Medway*, who places its N.W. end in lat. 10° 28′ S., long. 147° 28′ E. As the position of this danger is still doubtful, it should be passed with caution.

Hood Bay, immediately on the East side of Hood Point, is about 7 miles wide from East to West, and between 3 and 4 miles in depth; its shores are low and woody. The eastern point of the bay is like a pier, or embankment, forming the West side of a narrow and shallow opening, leading into a remarkable circular lagoon. *Macgillivray Range* extends from the back of the hills behind Paira Point, E. by S. 18 miles, and is moderately high and scantily wooded. *Kemp-Welsh River*, emptying itself into the bay, was ascended by the Rev. T. Beswick for about 18 miles.

Hood Lagoon, on the East side of Hood Bay, was examined by the Revs. Macfarlane and Lawes, in the Mission steam vessel *Ellangowan*, 1876. It is about 15 miles in circumference, and *Dundee River* empties itself through a shallow entrance at its head. There is a village on the eastern point of the lagoon entrance, which entrance is narrowed by a shoal of 9 ft. at half-flood, extending 1 cable S.W. of the West point. Anchorage may be obtained in 6 or 8 fathoms at the entrance, inside which are some 2½-fathoms shoals.

At 15 miles E. ½ S. from Hood Point is *Keppel Point*, a low projection of the main land, from which *Cape Rodney* lies East, distant 24 miles. *Coutance Isle*, well wooded, lies close inside the Barrier Reef, at 9 miles E. by S. ¾ S. from Keppel Point, and between them is an opening through the reef 6 miles wide, probably caused by the fresh water from Marshall Lagoon. Lieut. de Hoghton, of H.M.S. *Beagle*, 1879, reports that a chain of shoals was observed extending to the N.N.E. from about 2 miles N.N.E. of Coutance Island.

Marshall Lagoon lies northward of Coutance Island, and consists of two lagoons divided by a passage half a mile wide. The outer one is named *Macfarlane Harbour*, into which a good deep passage, 150 yards wide, is said to exist. Into the upper lagoon flows the *River Devitt*.

Cheshunt Bay lies about 11 miles eastward of Macfarlane Harbour; the Mission vessel anchored on its eastern side. *Cheshunt* and *Reynolds Rivers* enter the head of the bay; their entrance is about 6 ft. deep, but it deepens inside. *Sandbanks Bay* lies 10 miles eastward of Cape Rodney; Domaru River falls into its head, and anchorage was found off its mouth in 2 fathoms. H.M.S. *Beagle* anchored on the western side of the bay.

Sunday Passage, through the reef, lies 4 miles E.S.E. of Coutance Island. *Rodney* entrance, 7miles S.S.E. of Cape Rodney, is 2½ miles wide, with anchorage just within the point forming the eastern side of the entrance in 21 fathoms. The breakers will mark out the entrance. The Barrier Reef, immediately eastward of the Rodney entrance, forms a bight, which must not be mistaken for the entrance itself; thence it trends to the eastward, and appears to terminate at 10 miles E.S.E. of Table Point, which is low, but well defined. Rounded

and Table-topped Hills back the low coast between Cloudy Bay and Table Point. *Grange Isle* lies on the reef S.W. ½ W. 4 miles from Table Point; on its West side is a clear passage, and another 2 miles S.E. of it. At 15 miles eastward of Rodney entrance is another opening half a mile wide, through which H.M.S. *Beagle* passed, finding depths of more than 17 fathoms in it. At 5 miles farther eastward is another opening a mile wide.

Cloudy Bay is an opening, 10 miles wide, midway between Cape Rodney and Table Point, a distance of 31 miles in an E. ½ S. direction. The eastern side of the bay is hilly. The bay is divided into two by a reef extending 4 miles S.W. from Sewell Island. The *Ellangowan* anchored in the western portion; H.M.S. *Beagle* anchored in 5 fathoms nearly abreast of Eugenie Island, but the channel was extremely intricate. *Robinson Harbour* is in the N.E. part of the bay; its entrance is a cable wide, with 2½ to 3 fathoms.

Colombier Point, the East point of Cloudy Bay, is low and sandy, with many shoals off it. Small vessels will find sheltered anchorage N.W. of it, but the approach is obstructed with shoals. There is also said to be anchorage in 3 fathoms, N.W. of Forrest Point, 3 miles to the eastward, and here water may be procured; but the natives are treacherous. *Baxter Bay* lies between Forrest Point and Table Point, and has several shoals in its western part. Anchorage can be obtained in 17 fathoms, off the N.E. side of Grange Island.

Owen Stanley Range trends from Mount Owen Stanley, south-eastward, 95 miles, and then turns suddenly north-eastward. As there is a great uniformity in the profile of this mountain chain, it will only be necessary to notice the three following summits:—*Mount Obree*, North, 40 miles, and *Mount Brown*, N. by E. ¼ E., 32 miles from Keppel Point, have nothing remarkable in their appearance; the former is 10,246 ft., and the latter 7,947 ft. high. *Mount Clarence*, N.E. by N. ¼ N., 20 miles from Cape Rodney, has its top perfectly flat on the western side; it rises to 6,330 ft. in height.

Between the base of these mountains and the extensive tract of level land from Round Head to Cape Rodney, are numerous hills; the most conspicuous of these is a remarkable pyramidal hill.

Table Bay is a slight indentation of the main land on the eastern side of Table Point; its eastern extreme is a low point on the West side of a well-defined opening, like the mouth of a river, at E. ½ N., 20 miles from Table Point. *Amazon Bay* lies between the eastern point of Table Bay and a bold, hilly headland, at E. by S. ½ S., 7 miles from the point; it is much encumbered with shoals. The natives hereabout are treacherous.

A cluster of islands lies off Amazon Bay, and one of these, *Toulon Isle*, rises to a peak at its centre, 300 ft. high, which is visible 30 miles off. At 5½ miles S.W. ½ W. from this island is a dry sand-bank, on the western part of a coral reef 3 miles long, which covers at high water.

At the East extremity of Amazon Bay the coast recedes and forms *Mayri Bay*, a fine large bay, with good and sheltered anchorage in 10 to 6 fathoms, mud,

during the S.E. monsoon. *Millport Harbour*, eastward of Mayri Bay, has an entrance about half a mile wide, with a depth of 11 to 7 fathoms, mud, which is the general depth in this excellent and capacious harbour. At the head of the harbour is a cove where water can be obtained. The country here is mountainous. *Port Glasgow*, divided from Millport Harbour by an isthmus, is about 2 miles long East and West, with depths of 5 to 7 fathoms.

A steep coast range extends 6 miles eastward of Amazon Bay, thence the coast is low and woody for a distance of 22 miles in an easterly direction, form- the shores of *Orangerie Bay*. In the eastern end of this bay are *Dufaure*, and several other smaller islands. The summit of Dufaure Island is 1,622 ft. high, and two coral shoals lie, one of 5 fathoms 12 miles south-westward, and the other of 6 fathoms 10 miles southward of this summit. H.M.S. *Rattlesnake* passed another of 7 fathoms at 9 miles S.W. from Dufaure summit. Several reefs awash are said to exist about 3 miles northward of that portion of the sunken barrier reef lying between long. 149° 43′ and 149° 50′ E.

The S.W. part of Dufaure Island is connected with Ropo Ropo Island by a reef, uncovered at low water nearly its whole extent. Good well-sheltered anchorage during the S.E. monsoon will be found westward of this reef in 12 fathoms, stiff mud; but the space is somewhat contracted, as the fringing reef extends half a mile from Dufaure Island. This anchorage is readily accessible.

Mullens Harbour, situated in the eastern part of Orangerie Bay, eastward of Dufaure Island, is about 8 miles long East and West, by about 4 miles wide, and has depths of from 9 to 11 fathoms. The entrance, which is about 2 miles wide, appeared free from obstruction. Between the eastern side of Dufaure Island and the mainland is a good passage about three-quarters of a mile wide, and from 6 to 10 fathoms deep, through which the *Ellangowan* steamed. The natives were friendly.

Eagle Point is a sharp rocky projection, S.E. by S. ½ S. 2 miles from the South extreme of Dufaure Island. *Cone Point*, S.E. by E. ½ E. 2 miles from Eagle Point, is so called from having a remarkable conical hill on it, 543 ft. high. From Cone Point the coast, consisting of a series of low points and deep bays, trends E. by S. ½ S. 16 miles to Tree Islet. *Webb Isles* lie from 2 to 3½ miles eastward of Cone Point; and *Roux Isles* form a cluster, nearly midway between Webb Isles and Tree Islet. The country, for the first 9 miles eastward of Eagle Point, consists of hills and woody valleys; a steep lofty coast range then takes its rise, trending eastward 12 miles, to *Cloudy Mountain*, a rounded peak, the highest part of the above lofty coast range, bearing N. by W. 9½ miles from South Cape. It is 4,477 ft. high, and visible in clear weather at least 40 miles off.

Argyle Bay is a deep indentation between Dufaure Island and Eagle Point. *Port Dudfield*, eastward of Cone Point, is completely landlocked, with depths of 10 to 7 fathoms. There is good anchorage in 10 fathoms, mud, northward of the island lying off the western entrance point. *Ellangowan Bay*, eastward

of Port Dudfield, is described as a fine bay of considerable extent. *Meikle Bay* lies next to the eastward. *Isabel Cove*, 5½ miles eastward of Cone Point, affords a small but good anchorage, sheltered from all winds. Water can be obtained from a stream. The *Ellangowan* anchored in 6 fathoms, in *Fyfe Bay*, formed between Roux Islands and the coast. A 2-fathoms shoal is reported to lie 2½ miles S.E. ¼ E. from the southern island.

Farm Bay is a deep inlet between Tree Islet and Rugged Head, 4 miles to E. by S. ½ S. *Baxter Harbour*, at its head, afforded anchorage in 6 fathoms. H.M.S. *Bramble* anchored in 22 fathoms, mud, just within the entrance of the bay.

South Cape, in lat. 10° 43′ 30″ S., long. 150° 14′ E., bold and cliffy, the southernmost extremity of New Guinea, was found to be an island, the *Ellangowan* steaming through *Marri Pass*, the channel between it and the coast. The island is now named *Stacey*; at half a mile off it is *Wedge Rock*, 40 feet high, deriving its name from its shape. *Marri Pass* is 1 cable broad, with a depth of 9 fathoms in the centre. H.M.S. *Sappho*, in 1878, anchored in 13 fathoms, about a quarter of a mile W.N.W. from the Mission station on the North point of the island. *Bertha Lagoon*, North of Stacey Island, is of considerable extent, but shallow.

Catamaran Bay is 5 miles wide from W.S.W. to E.N.E., and appeared to be about 3 miles in depth. *Tissot Isle*, 3 miles eastward of South Cape, is remarkable for having a rounded peak at either end, nearly East and West from each other; a sunken danger is reported to lie half a mile N.W. of the N.W. end of the isle. From the eastern point of Catamaran Bay the coast trends 6½ miles to the eastward, with a steep range of hills rising at the back of it, to the height of 1,304 ft. A coral reef, about 1½ mile broad, extends along this shore, from the middle of the bay to 2½ miles eastward of it. There is a sand-bank on the reef, at about 1½ mile from its western end.

Leocadie Isles are a group of two small low islands and several rocks, also situated on the reef, near its eastern extreme; between these and the sand-bank is a small island, the position of which is doubtful. There is good anchorage in 8 fathoms, mud, northward of them, entering from the eastward.

Brumer Islands, six in number, are small, and of basaltic formation, lying south-eastward of Catamaran Bay. The westernmost and largest of the group is 2½ miles long, and from one-quarter to three-quarters of a mile broad. The highest part of this island is a peak near its N.E. end, 665 ft. high, and bearing E. ½ S. 8½ miles from South Cape. A vessel, by establishing a regular barter here, may obtain, in a few days, considerable quantities of yams and cocoa-nuts; but in a short-handed vessel great caution is required. A large cascade was seen near the North part of the principal island. The *Rattlesnake* and *Bramble* anchored on the N.W. side of the largest island in from 30 to 40 fathoms, blue mud; but the anchorage is not good, as the swell, with the prevailing S.E. wind, rolls round both points.

Like Dufaure Island, the Brumer group must be approached with caution, on account of the sunken barrier, two portions of which were met with, one with 10 to 15 fathoms, bearing S.W. by S., 5 miles, and the other with 8 to 11 fathoms, S.E. ½ E., 8 miles, from the peak of the western Brumer Island. Mr. W. Powell also observed a large shoal to the N.E. of the largest island, on which the least depth found in passing over it in the ketch *Star of the East*, in 1877, was about 3 fathoms.

Arch Islands, about 10½ miles East of the eastern Leocadie Island, are small, high, and lie close together on a reef nearly 3 miles in circumference. *Castori Island*, 4½ miles S.E. of Arch Islands, is high, rocky, and covered with scrub; a reef extends a mile N.W. of it. *Dumoulin Islands* consist of a group of four islets, and four detached rocks. The N.W. islet is inhabited, and 400 ft. high, bearing nearly E. by S. 23 miles from Brumer Islands peak. Great caution is necessary in approaching these islands, as the depths appear to be irregular.

Heath Point, the easternmost extremity of the South coast of New Guinea, delineated in Capt. Stanley's survey, is a rocky point nearly E.N.E. 18½ miles from the peak of the West Brumer Island, and forms the extreme of the bay of the same name.

Heath Island is situated about 17 miles E.N.E. from the peak of the West Brumer Island, and is 4½ miles long N.W. and S.E., by about a mile broad. Of its two peaks the southern is a little higher, rising to an altitude of about 1,000 ft.; they appear in the shape of a saddle from the East or West, are well defined and thickly wooded, forming a conspicuous mark for the locality of China Strait. H.M.S. *Conflict* anchored in the bay on the N.E. side, in 9 fathoms, sand.

A dangerous shoal, with probably less than 6 ft. over it, lies half a mile N.E. from the S.E. extreme of the eastern of the two islets lying close northward of Heath Island. Water can be procured from a stream in *Musters Bay*, on the East side of Heath Island.

Heath Reefs, an extensive cluster of shoal patches, were seen extending for 2 or 3 miles to the westward of Cocoa-nut Rock (S.W. of Heath Island); the tail of one of these was passed over by H.M.S. *Basilisk* in 7 fathoms. Capt. Liljeblad, of the *Ellangowan*, 1883, reports there is nothing less than 20 fathoms on the reported position of these reefs, and H.M.S. *Beagle* also passed over, and no indication of shoal water was seen.

Blanchard Island (of D'Entrecasteaux), S.E. 2¾ miles from the S.E. point of Heath Island, is nearly 2 miles long E.N.E. and W.S.W., by about a mile in breadth. The N.E. peak, which is the summit, rises to a height of 400 ft. A wooded islet, half a mile long, lies a cable from the East point of the island; and a village was seen in a small sandy bay on its N.E. side. No landing was effected here, nor were the depths in the vicinity ascertained. Midway between Heath and Blanchard Islands are three small islets, the middle one,

250 ft. high, being the highest. There is good anchorage in 12 fathoms, during the S.E. monsoon, off the N.W. side of Blanchard Island.

Beehive Islet, 250 ft. high, is distant rather more than 2 miles S.E. of the East point of Blanchard Island.

CHINA STRAIT, dividing the S.E. part of New Guinea from Hayter Island, is about 4 miles long N.E. by N. and S.W. by S., by rather more than three-quarters of a mile wide in its narrowest part. Capt. Moresby, in his exploration in 1873, considered that this strait might afford a shorter route to China, hence its name. Upon further examination, however, it was found that the intricacy of the navigation to the north-eastward of the strait, caused by numerous obstructing reefs, was so great as to render preferable the route some 25 miles farther East, which is described with the Louisiade Archipelago. On the western shore of China Strait there is abundance of water easily procurable by vessels.

Coast, *Middle*, and *Dinner Islets*, are small, similar in appearance, and situated at the S.W. entrance to China Strait. Coast Islet, about 300 ft. high, is the highest of the three. All are thickly wooded, and fringed by coral reefs. There is a Mission station on Dinner Islet. There is convenient anchorage for sailing vessels waiting for the tide to pass through China Strait, in 6 to 9 fathoms, mud, about 1½ cable N.W. of Dinner Islet.

Hayter Island, which forms the principal portion of the eastern shore of China Strait, is 5 miles long E.S.E. and W.N.W.; the inhabited parts are on the West and S.W. sides. *Mount Haines*, its summit is conspicuous, and rises about 900 ft. high, near the S.W. extremity; cultivation is carried on almost to the top.

Possession Bay lies on the West side of Hayter Island, and is so named from Capt. Moresby having here taken possession in the name of Her Majesty the Queen. It is about a mile long, 4 cables deep, and affords safe anchorage out of the influence of the tides of China Strait, but is somewhat difficult for a sailing vessel to approach. Anchorage may be found in about 12 fathoms, mud, 3 cables from the shore. Inferior water can be procured at a well 12 ft. deep, dug by the crew of H.M.S. *Basilisk*, at a cable's distance inland, and near the bed of a mountain torrent. The natives brought off supplies to H.M.S. *Basilisk* in exchange for iron hoop.

It is high water, on full and change, in Possession Bay, at 8^h; springs rise about 5 ft., and neaps 2½ ft. The flood sets to the northward, and the ebb to the southward, attaining at springs a velocity of 5 knots an hour.

Four small rocky bays form the northern shore of Hayter Island; the West point of the western bay being *Scramble Point*, the North point of Possession Bay. H.M.S. *Beagle* found good anchorage in *Stanley Bay*, on the South side of the island.

Mekinley Island, on the East side of China Strait, and near its northern end, is about 200 ft. high, and affords a mark by which to detect the strait, if

approaching from the northward. *Paples Island*, uninhabited, 250 ft. high, and thickly wooded, lies half a mile to the eastward of Mekinley Island. Between Paples Island and Scramble Point is a small islet covered with grass, termed *Button Islet*, bearing from the latter point N.E. by E. ½ E., distant 8 cables. *Brewer* and *Head Islets* are high and thickly wooded, with round summits. They bear East from Scramble Point, distant about half a mile and 1½ mile respectively. *Didymus Island*, about 1¼ mile long by half a mile in breadth, is situated 1½ mile eastward of Paples Island. No signs of natives were seen.

Midway between the North extremes of Paples and Didymus Islands, a sand-bank with stones on it, which uncovers, was observed by Lieut. Richards, H.M.S. *Renard*, 1879. At 1 mile N.N.E. from Mekinley Island, are two shoal patches of sand. Vessels approaching from the southward and intending to proceed East, should not haul to the eastward after passing Mekinley Island, until these two last-mentioned patches are made out.

China Rock, which seldom breaks, is reported to lie in the northern part of China Strait, with Paples Island bearing S.S.W. distant 1½ mile, and the centre of Didymus Island, S.E. ¾ S. 2 miles. Two patches of reef have been seen between the rock and Mekinley Island.

North Foreland is a steep, bluff, rounded headland, forming the N.E. point of the southern prong of the fish-tail, to which the eastern part of New Guinea may be likened. To the westward of it the coast forming the southern shore of Milne Bay continues bold and steep, and is slightly indented by a succession of small bays, which have not been minutely examined. Small cascades of fresh water abound in this part. A 4-fathoms coral patch lies about a mile S.E. by E. of North Foreland, and discoloured water of about 4 fathoms 1½ mile eastward of the same headland. *Spike Island*, 1¼ mile N.W. of the North Foreland, is low and woody, and about a mile in diameter; a coral reef connects it with the shore.

MILNE BAY was first discovered by Capt. Moresby in 1873. Previously the S.E. end of New Guinea was thought to end in one point, named the East Cape. The bay named after Sir Alexander Milne separates the N.E. and S.E. arms of the eastern part of New Guinea, and is about 25 miles deep East and West, and 8 miles broad. The Owen Stanley Range terminates at the head of the bay; running parallel to this range, and separated by extensive valleys, are the Cloudy Mountain and Stirling Ranges. There are numerous villages, and much cultivation on the southern shore of the bay. The water here is very deep, but in the small bays anchorage may be found in 15 or 20 fathoms. At the head of the bay is a plain thickly populated. A vessel may, during the S.E. monsoon, find a snug anchorage off the western end of Spike Island, before described. H.M.S. *Basilisk* anchored off the South shore of Milne Bay in 14 fathoms, about 3 miles westward of Spike Island; and H.M.S. *Sandfly*, in 1874, anchored in the same vicinity, and replenished with excellent water,

which may be obtained at numerous places on the South side of Milne Bay, westward of Spike Island.

Discovery Bay, about 15 miles westward of Spike Island, is a snug anchorage on the South shore of Milne Bay, about 5 miles from the head of the latter. The entrance lies between a reef above water, with several islets and one small bush on it, and Surprise Point, the N.E. extremity of the bay. Vessels should keep the eastern bight of the cove on board, as the shore there is steep-to; the western side has an extensive shore reef, not always discernible. The water which runs through the village is not recommended for use, but round either the East or West points of the bay abundance of fresh water may be obtained. Pigs, yams, &c., were obtained from the natives in exchange for old iron hoop and axes.

Aleford Islets, four in number, small, and surrounded by reefs, are situated at the head of Milne Bay. The depths outside them increase from 10 fathoms at half a mile off, to 20 and 30 fathoms at distances of 1½ and 2½ miles.

About 20 miles to the eastward lie *Killerton Islands*, where there is a large bay, in which anchorage may be found, between the eastern island and the shore, in from 12 to 13 fathoms, sandy bottom. The passage to the anchorage is from the eastward, keeping mid-channel between the eastern island and the shore. Caution is necessary, as coral patches abound near all the islands. The anchoring ground is about a third of a mile southward of the village. A Mission station was established here. *Mount Killerton*, in the Stirling range, rises immediately above Killerton Islands, to an altitude of about 1,357 feet. In approaching Goschen Strait from the westward this mountain affords a good mark, the top being seldom clouded. The two peaks next East of Mount Killerton, are tufted, a small group of large trees growing near the summit of each.

EAST CAPE of New Guinea lies 10 miles eastward of Mount Killerton. The hills along the narrow promontory forming the North side of Milne Bay here end in a double summit 388 ft. high. The whole of this part of New Guinea is thickly populated, the villages being mostly on the northern shores; it is well watered, and of unusual beauty and fertility. Large quantities of supplies may be obtained in exchange for iron hoop.

Anchor and *Chain Islets*, situated N.E. of East Cape, on a tongue of coral reef, N.E. and S.W. of each other, 1¼ mile apart, are small, low, and thickly wooded. Anchor Islet is the larger of the two. To the southward of Anchor and Chain Islets, and between them and Lydia Island, the depths are irregular, and numerous coral reefs, upon which the sea often breaks, block up what would otherwise be the shortest route through Goschen Strait.

The *Basilisk* anchored in 16 fathoms, sand and coral, half a mile South of Anchor Islet.

BASILISK ISLAND, to the eastward of Hayter Island, China Strait, forms

three sides of a hollow square open to the West. The island is 8¼ miles long East and West, by 7½ miles North and South, its breadth varying from a half to 3½ miles. The land rises to a narrow, thickly wooded ridge of hills throughout its entire length, averaging from 300 to 900 ft. in height. *Mount Goodman*, the highest peak, rises to an altitude of about 900 ft., at the distance of rather more than a mile S.W. by W. ½ W. from the point of the same name. Only one village was noticed, and that was in the N.E. part.

Rocky Pass is a narrow channel or gut separating Hayter Island from Basilisk Island. The tides run with great strength through the pass, with a heavy overfall to the southward. The pass is not navigable for ships, but a well-manned boat may use it, except during strong S.E. winds.

Jenkins Bay is formed by Hayter Island on the West and Basilisk Island on the South, East, and North. It contains numerous shoal patches, the positions of which are uncertain, and the bay has no known anchorage. A few scattered cocoa-nut trees were seen upon its shores, but no villages, canoes, or signs of habitation.

Razor Islets are two in number, and 200 ft. high; the outer one lies S.E. by E. 3 miles from the S.W. point of Basilisk Island.

Margaret Island, half a mile South of the S.E. point of Basilisk Island, is 1½ mile long East and West, half a mile broad, and about 500 ft. high, with rather a level, thickly wooded summit. There is a village on its South shore, constantly resorted to by the natives of the neighbouring islands. The channel between Margaret and Basilisk Islands should not be attempted by a sailing vessel, unless with a commanding wind and at slack water.

Negro Head, the N.E. point of Basilisk Island, is surrounded by a coral reef, which extends about 2 cables to the North, half a mile to the West, and 3¾ miles to the eastward.

Fortescue Strait separates Basilisk from Moresby Island, and is about 2 cables broad at its southern end, opening out in a bell-like shape to a width of 1½ mile at the northern. The South entrance is deep and narrow, but the shoal water extending East of Goodman Point appears at first sight to effectually block up the approaches from the northward. For the position of its shoals the chart is the best guide. It is high water, on full and change, in Fortescue Strait at 8^h; springs rise from 4 to 5 ft. The flood stream sets to the North, and ebb to the South; at springs the tidal streams set at the rate of 5 knots in the narrow part of the strait.

MORESBY ISLAND, forming the eastern boundary of Fortescue Strait, is 10 miles long, East and West, and has an average breadth of 3½ miles, its highest part culminating in three well defined peaks, of which *Mount Fairfax*, the highest, has a peculiar knob-shaped summit, by which it may be recognized. It is 1,340 ft. above the level of the sea, and conspicuous from all directions. The island is thickly inhabited. No place was found where a vessel could

obtain water. There are many deep bights and indentations, two of which (Hoop-iron and Pitt Bays) afford secure anchorage.

Pigeon Islet is small, and covered with trees and long grass, the summit being about 60 ft. high. It bears S.W. a quarter of a mile from the S.W. point of Moresby Island. *O'Neill Island*, near the South entrance of Fortescue Strait, is hilly, the summit being about 580 ft. high, and upon the level grass-grown ridge extending to the S.E. was a large tree, of dark foliage, which afforded an excellent mark from the southward. A similar tree, but smaller, situated on a lower part of the same ridge, only showed out when seen from the eastward. The principal village in O'Neill Island is in a small bay on the N.E. side, off which the *Basilisk* anchored in 15 fathoms; but it is somewhat exposed during the S.E. monsoon.

Hoop-iron Bay, so called on account of the great demand for that article evinced by the natives, is situated on the S.W. side of Moresby Island. The land surrounding the bay varies in height, from about 1,200 ft. at Double Peak over Green Point on the East side, to 400 ft. at Smooth Green Peak on the West. This bay affords good anchorage, protected from all winds except those blowing from East to S.S.E., in 13 fathoms, stiff mud, sheltered by O'Neill Island, which lies to the southward. The approximate time of high water, on full and change, at Hoop-iron Bay, is $8^h\ 30^m$.

Green Point may be termed the eastern point of Hoop-iron Bay, though the coast continues to trend for 3 miles in an easterly direction, curving round gradually to the southward, to *Rocky Point*. A rock lies E.S.E. $1\frac{1}{2}$ mile from Green Point. *Rocky Islet* lies S.E. $\frac{1}{4}$ S., southerly, $2\frac{1}{4}$ miles from Green Point, and W. by S. $\frac{1}{4}$ S. a little more than a mile from Rocky Point.

From the South point of Moresby Island the coast trends N.E. $\frac{1}{2}$ E., rocky and steep, for a mile, to a prominent point which forms the southern boundary of James Bay, and which almost joins Haines to Moresby Island.

The approaches to *James Bay* are very confined, but it has tolerably good anchorage, and is about a mile deep in a westerly direction by half a mile wide.

Haines Island has a saddle-shaped summit, the two peaks of which rise to a height of about 250 ft. There is a narrow boat channel, through which the tide runs with great rapidity, between this islet and the S.E. point of James Bay.

Connor Island is shaped like a triangle, the apex being to the North, and each side $1\frac{1}{4}$ mile in length. It has three peaks about 430 ft. high, near its centre, and is well wooded throughout. The channel between Connor Island and Haines and Moresby Islands, about a mile in width, has depths of 29 and 24 fathoms. A black-headed rock, showing at half-tide, is situated nearly mid-channel; from it the North point of Connor Island bore E. by N. 11 cables. The channel eastward of it is recommended.

Glenton Island, three-quarters of a mile long North and South, by a quarter of a mile broad, is of regular shape, and rises to a thickly wooded and well defined peak, 390 ft. high. Crowning the summit is a large tree, which was

rendered conspicuous by clearing the surrounding wood away, to make a mark for surveying purposes.

Smith Islet is small, low, thickly wooded, and uninhabited. A coral reef connects it with the East side of Glenton Island, from which it is about a quarter of a mile distant.

The navigator viewing this district from a distance of 20 or 25 miles, might suppose that as far as Smith Islet the land from the S.E. cape of New Guinea was continuous, and this would account for the error fallen into by former explorers in so describing it; for what was formerly considered to be the S.E. cape of New Guinea is almost identical in geographical position with Smith Islet.

Maben Islet, about a mile E.N.E. of the North point of Connor Island, is low and thickly wooded. In the channel, between Maben and Connor Islands, is a sunken coral patch, having 18 ft. water.

Pitt Bay is the largest indentation on the East side of Moresby Island, being $1\frac{3}{4}$ mile long North and South, by about the same distance in depth. Three bright green bluffs, about 60 ft. high, are a remarkable feature in the bay. Fairfax Ridge, near the centre and at the back of the bay, here rises to an altitude of upwards of 1,200 ft. A low flat islet is situated on the S.E. side of Pitt Bay. On the eastern side of this islet are two more remarkable green bluffs, to the northern one of which the name of *Emerald Point* was given.

The northern point of Pitt Bay is well marked by a conical brown rock, about 20 ft. high; the rock resembles a *can buoy* in appearance, and gives its name to the point. The depths in the centre of the bay vary from 13 to 22 fathoms, sand and coral, but in a line from the S.W. corner to Can-buoy Point, are four coral knolls, having depths of 6 to 13 ft. The *Basilisk* anchored in 12 fathoms, white sandy bottom, with the Inner Green Bluff bearing S.E., distant 3 cables; and Can-buoy Rock N.E. $\frac{1}{2}$ N., 2 miles nearly.

In entering Pitt Bay the southern shore should be kept at the distance of about half a mile, until the Inner Green Bluff bears S.E., which is as far in as a vessel should go. In the S.E. monsoon it is probable that considerable sea enters this bay. Sandfly Bay of Skelton Island, or Flinn Bay on the North coast of Moresby Island, will at that season be found preferable.

Water may be found in the small bight in the N.W. part of the bay, and also in the S.W. bight, but so far from the beach as to be inconvenient for conveyance to ships' boats except in casks. Natives were seen in great numbers in Pitt Bay. Pigs, yams, taro, arrowroot, and bananas were procured for hoop-iron and red handkerchiefs. As many as fifty large canoes, each capable of holding 40 or 50 men, were sometimes around the *Basilisk* at one time.

The coast of Moresby Island from Can-buoy Point trends N.N.W. for nearly $1\frac{3}{4}$ mile to Cape Lookout.

Flinn Bay.—From Cape Lookout the coast trends West for three-quarters of a mile, with a small indentation, after which Flinn Bay forms a double bight

1¼ mile deep, to North Point. *Pitt Islet* is almost joined to a tongue of land, which divides the two arms of Flinn Bay. The islet is small, low, and covered with trees. Between the South point of the reef surrounding it, and the dividing point of Flinn Bay, is a narrow channel, having 5 to 7 fathoms water. From the North point of the reef of Pitt Islet, Cape Lookout bears E. by S. ¼ S. distant 6 cables, and the centre of Grant Islet N. by W. ¼ W., distant nearly 2 miles. A 3-fathoms shoal lies 1 mile N.W. ½ N. from Cape Lookout.

Anchorage may be found in 16 fathoms, mud, in the eastern arm of Flinn Bay, with the centre of Pitt Islet bearing N. by W. ¼ W., and Shortland Islet seen just clear of the North point of entrance. Caution is requisite in rounding the North point, when entering this bight, as a coral ledge, rather difficult to detect, extends seaward from the point more than half a cable, and is steep-to. Water was found at the head of the bight. Small casks might be filled, and brought off to a boat.

South-westward of Pitt Islet is the western arm of Flinn Bay, about 1¼ mile deep, and affording good anchorage in from 14 to 16 fathoms, mud. A coral ledge extends a cable off the projecting point, which is situated to the S.W. of North point, otherwise this bight of Flinn Bay appeared clear of danger.

North Point, Moresby Island, is salient, clear of trees, and covered with long grass. It bears W. by N. 2½ miles from Cape Lookout, and has a small coral reef extending from it. To the westward of North Point are two small bays, and westward again *Mudge Bay*, about a mile deep. A small stream flows into the head of the bay. Anchorage may be found here in 11 fathoms, sand and mud, well protected except from northerly winds. Mr. Powell states that in 1877 the bay appeared to be full of shoals. Water is procurable at a stream which flows into the sea at about 2 miles westward of Mudge Bay. There is a village on the western bank, and room for a boat inside. The natives here are friendly.

Grant Islet bears N.W. ¾ N. 3 miles from Cape Lookout, and N.N.E. 1¾ mile from North Point (Moresby Island). It is low, of coral formation, the higher portion being covered by open trees. Discoloured water, in which soundings of 4 and 5 fathoms were obtained, was seen stretching for a considerable distance towards Basilisk and Moresby Islands. *Shortland Islet*, 200 feet high, about a third of a mile in extent, bears N.E. by E. 2¾ miles from Grant Islet, and is surrounded by coral reefs, extending on the western side to the distance of half a mile, and to the eastward in an angular horse-shoe shape, for 3½ miles.

Between Shortland and Grant Islets there is a passage 2½ miles wide, but narrowed by the reefs of both islets and a detached 5-fathoms patch, to 1½ mile. None but a steam vessel, or a sailing vessel with a commanding breeze, should attempt this passage, as the tides are swift. *Byron Islet* forms a triangle with Grant and Shortland Islets, and marks well the southern extremity of Shortland Reefs.

This islet is the last included among the islets of New Guinea proper. The islets to the eastward, forming the Louisiade Archipelago, will be hereafter described.

The coast of New Guinea westward of East Cape trends W. by S. ¼ S. for 10 miles to *Basilisk Point*, immediately over which rises Mount Killerton. Goschen Strait is hereafter described.

Bentley Bay, between Basilisk Point and Cape Ducie, affords an indifferent anchorage, the water being very deep close to the shore. Anchorage was found in 15 fathoms, sand, to the eastward of a coral sand-bank about a mile from the western shore. The inhabitants are numerous, and showed a friendly disposition. *Cape Ducie* is low, rocky, and thickly wooded, and bears from Basilisk Point W. by N. ½ N., distant 6¼ miles. *Annie Inlet* lies between Bentley Bay and Cape Ducie, and extending in a south-westerly direction, appeared to be about 2 miles deep, by three-quarters of a mile broad. In the entrance to the N.E. is *Catharine Island*, low, and covered with mangrove trees. *Excellent Point* bears W. ¼ N., 2½ miles from Cape Ducie, *Small Bay*, having its shores lined with mangrove swamp, lying between. Westward of Excellent Point, the N.E. coast of New Guinea forms a bay about 2 miles deep, called *Chads Bay;* it then takes a W. by N. ½ N. trend for 15 miles to a somewhat prominent point, and then continues without change of feature to Cape Frere. Between Excellent Point and Cape Frere the coast seemed clear. Numerous cascades and watercourses are seen running down the mountain sides as Cape Frere is approached.

Cape Frere, 25 miles W. ¾ N. from Cape Ducie, and S.W. ¼ W. 39 miles from Observation Islet, of Normanby Islands, is a bold, steep bluff, rising to a round whale-backed summit, about 3,000 ft. high, which is precipitously steep-to and without coral reef. *Bartle Bay*, immediately westward of Cape Frere, is about 4 miles long, by 1¾ mile deep. A small river, not navigable for boats, disembogues in its S.W. corner. No good anchorage could be found here. At the head of the bay the depth found was 49 fathoms. The country at the back of the flat alluvial land bordering Bartle Bay is a succession of table lands, varying in height from 200 to 1,500 ft., rising in terraces. In the background there is a confused mass of high peaks, varying in height from 3,000 to 6,000 ft. The villages are small and poor looking.

Goodenough Bay, 37 miles deep in a north-westerly direction, has its entrance between Cape Frere and Cape Vogel. The natives appeared honest and friendly. The South shore of the bay is steep-to, 250 fathoms having been found at 2 miles off it. The northern shore is, however, quite of a different character. *Mosquito Islands* lie E.N.E. distant about 12½ miles from the head of the bay; they are low, flat, and covered with trees. Good anchorage was found to the southward of them, about half a mile from the shore, in 16 fathoms, stiff muddy bottom.

Cape Vogel. – In making this cape it will be noticed that the hills which

form the peninsula are low and flat, and it is not before a vessel is within 8 miles that the whole of the land forming the promontory is seen.

Collingwood Bay, about 25 miles across, by 20 miles deep, extends in a westerly direction to the north-westward of, and parallel to, Goodenough Bay, forming the second large notch or indentation on the N.E. coast of New Guinea, westward of East Cape. There are numerous shoals and discoloured patches in the bay. On no account should it be navigated except in the finest weather, and with a look-out from the mast-head, until it is better known.

The South and West shores of the bay are low and flat, with several rocks and islets off it. The northern part of the bay is bold, rocky, and steep, *Mounts Victory* and *Trafalgar*, about 4,000 ft. high, rising in a massive lump, named *Cape Nelson*, which bears from Cape Vogel N.W. by W. ½ W., distant 59 miles.

Dyke Acland Bay forms the third deep indentation on the N.E. coast of New Guinea westward of East Cape; it is about 37 miles across from Low Point on the South to Cape Sud Est on the North, and about 13 miles deep. Its shores throughout are low. Soundings, where taken, were found to vary from 34 to 25 fathoms, over a bottom of mud, at a distance of from 4 to 8 miles off shore, and no discoloured water or coral patches were sighted. At the back of the bay a range of mountains, 1,500 to 2,000 ft. high, rises about 6 miles inland. *Cape Sud Est*, so named by D'Entrecasteaux, is low and woody, and without any marked features.

Cape Killerton, bearing 10 miles N.W. of Cape Sud Est, is similar to that cape. About 5 miles W. by S. ½ S. of it is a small eminence or rise about 150 ft. high. From Cape Killerton, and between it and Caution Point, a distance of 27 miles, the coast forms *Holnicote Bay*, the densely wooded shores of which are low, for many miles back into the interior. *Caution Point* is bold, and terminates to the southward in a bluff, which D'Entrecasteaux mistook for the South part of an island. Anchorage was obtained about three-quarters of a mile south-eastward of Caution Point in 15 fathoms, sand. The natives were inclined to be treacherous.

Cape Ward Hunt is bold and well defined, bearing N. by W. ½ W. about 9 miles from Caution Point; the land over it is about 400 ft. high and well wooded, and standing in the midst of low ground appears at a distance as an island. Between it and Caution Point are five rocky heads dividing small bays. *Mitre Rock*, about 40 ft. high, stands in an isolated position about two-thirds of a mile north-eastward of Cape Ward Hunt.

Ambush Point is low, and lies 5½ miles W. by N. from Cape Ward Hunt. Upon each side of the point a small river flows into the sea, and immediately to the westward is *Traitors Bay*, 5 miles wide and 2 miles deep. Wood suitable for steaming purposes was easily obtained at Ambush Point, the vessel anchoring in 15 fathoms, sandy bottom, about half a mile westward of the point, and about a cable from the shore. The natives here were hostile, and

quite naked. Resistance was offered by them to a wooding party, but a rifle shot proved sufficient to scatter them.

Between *War Song Point*, the western point of Traitors Bay, and *Alligator Point*, N.W. by W. ½ W. 6 miles, the coast is low and wooded. Soundings of 11 fathoms, muddy bottom, were found at three-quarters of a mile from the shore in the bay between the points.

Hercules Bay is about 14 miles across at its mouth, by about 5 miles deep. Its southern shores are low and woody, but the western are hilly, being backed by *Broken Range*, which is about 400 ft. high. *Andrew Islands*, near the centre of Hercules Bay, are low and wooded. Soundings of about 28 fathoms prevail over the South part of the bay at a distance of 3 miles from the shore; but near the western side depths of 6, 7, and 8 fathoms were found, at distances of about 1½ mile from the shore.

Luard Islands, 10 miles northward of Andrew Islands, are similar to them in appearance. Midway between a rivulet enters the sea. Between the rivulet and Luard Islands is a bluff point, on which a bright spot was observed in the sunlight.

Hosken Island is about 150 ft. high, small and wooded, and bears from the outer Luard Islet N.W. by W. 7¾ miles. The coast between is steep, high, and even.

Layard Islets are two in number, small and low. *Bee* and *Wasp Islets* are small, low, and wooded, and lie 5 miles N.W. by W. ½ W. of the northern Layard Islet.

Deaf Adder Bay, 5 miles north-westward of Wasp Islet, is 1½ mile deep. The head of the bay appeared shoal, but indifferent anchorage was obtained in 35 fathoms near its eastern point, which is low, sandy, and wooded. The remainder of the bay is rocky and steep, and a range of hills extending along its western side attains an altitude to the southward of about 1,000 ft. No village or natives. North-eastward of the eastern point of this bay are *Straggling Islets*, 2¼ miles off shore, with *Fly Islets* to the N.E. of them.

Huon Gulf forms a deep indentation in this part of New Guinea. Wherever soundings were tried for in skirting its shores the depths found were great, and the shores seemed quite clear of coral reefs and isolated dangers, such as the mushroom coral patches found on the southern part of the coast. The ranges of mountains surrounding the gulf were generally of a height of about 2,000 ft. At the head of the gulf, and for about 2 miles inland, the country is low, and near Parsee Point, on the western side, the coast range is broken into by a deep valley; southward of this, bold, stony, wooded ranges border the coast, descending steeply to the water's edge.

Longuerue Islands are spread over the S.W. part of Huon Gulf. With the exception of Saddle Island, which is about 2⅓ miles in length and 700 ft. high, these islets are small, wooded, and rocky. The configuration of the land at the head of Huon Gulf might lead to the expectation that a large river would

empty itself in the vicinity, but such is not the case, the rivers and river beds being small, with barred entrances, and scarcely deserving the title of river. No villages were seen in the S.W. part of the gulf; northward of Parsee Point, however, they again become numerous. Many of the natives of this locality wear a peculiar head-dress of tappa, shaped like a Parsee hat, hence the name of Parsee Point.

On the coast range abreast Saddle Island, and bearing from it S.W. distant about 5 miles, is a prominent conical hill, about 1,200 ft. high. *Kuper Range* overlooks the coast, between Longuerue Islets and *Parsee Point*, a high and prominent peninsula, 30 miles to the northward. The summits were clouded at the time of passing, but towards the southern part of the range were estimated to reach an altitude of about 2,000 ft. Anchorage was found in 21 fathoms, mud, about 12 miles N.W. $\frac{3}{4}$ N. of Parsee Point, at about half a mile from the beach, the soundings gradually decreasing from 45 to 35 and 21 fathoms, muddy bottom.

The coast from the head of Huon Gulf trends about 43 miles to the eastward to False Islet, and is without any very marked features, being in some parts rocky, in others low and sandy. The *Rawlinson Range* here runs parallel to the coast line at about 3 miles inland, some of its summits reaching an altitude of 2,000 ft. A shoal patch, steep-to, 1½ mile South of a village, was seen in lat. 6° 44′ 30″ S., long. 147° 24′ E. Anchorage was found at 6 miles E. by N. $\frac{3}{4}$ N. of this shoal spot in 27 fathoms, mud and sand, about half a cable from the beach, but it was of an indifferent nature, the bottom being very steep.

Cretin Islands, four in number, are all small, low, and well wooded. They lie 6 miles E.S.E. of False Islet, in about lat. 6° 43′ 30″ S., long. 147° 53′ E., and are inhabited.

Cape Cretin, the N.E. extremity of Huon Gulf, is a bold headland of rounded shape, having three small islets off it close to the shore. The hills at the back of the cape are about 600 ft. high, with grassy slopes, well wooded in parts, the whole having a very picturesque effect.

Fortification Point, so called from the exposed strata of rock upon its face, rises steeply from the sea, and is bare and barren looking. Its approximate position is in lat. 6° 20′ S., long. 147° 48′ E., and it may be considered the south-eastern limit of the Finisterre range of mountains, although the land to the southward of it continues high, gradually decreasing in altitude towards Cape Cretin. The water had all the appearance of being very deep close up to this coast.

Cape King William is difficult to define, the coast rounding gradually and preserving its steepness. The part taken for Cape King William is a slightly projecting point, about 20 miles N.W. by N. of Fortification Point, with a village close to the northward of it.

Mount Cromwell, about 8 miles S.W. of Cape King William, rises from the eastern part of the Finisterre Range to a height of 7,700 ft., and takes the shape of a blunt cone, apparently covered with tropical forest. *Basilisk Gorge* is a huge break in the mountains, about 6½ miles north-westward of Mount Cromwell. No bottom with 100 fathoms of line could be found anywhere along this coast, at distances varying from 1½ to 3 miles from the shore, and the water had the appearance of being deep close up to the beach.

Mount Disraeli is a sharp, remarkable cone, 11,000 ft. high, situated in about lat. 5° 58′ S., long. 146° 29′ E. *Mount Gladstone*, also conical, but of a blunter shape than Mount Disraeli, was found to be about 11,400 ft. high. It is in about lat. 5° 56′ 30″ S., long. 146° 24′ 30″ E. These were the two highest peaks of the Finisterre Range sighted by the *Basilisk*. From long. 146° 30′ E. the coast, steep-to, continues its W. by N. ½ N. trend for about 32 miles to Cape Rigny.

ASTROLABE BAY was not visited by H.M.S. *Basilisk*, but from information supplied by M. Miklukho-Maclay, an accomplished Russian ethnologist and traveller, who had stayed there for about twelve months, it was ascertained that the bay has about 83 villages around its shores, containing in all about 4,000 inhabitants, among whom as many as twelve dialects were spoken. *Gabina River* flows into the South side of the bay. The inhabitants were generally friendly.*

Astrolabe Bay, so named after D'Urville's vessel, lies between *Capes Rigné* on the East, and *Duperré* on the N.W., about 24 miles apart, the depth of the gulf being about 18 or 20 miles. The Finisterre Mountains become lower when near the bay, which is completely surrounded by a line of mountains, even in the bight of the bay. Capt. B. Moore visited the bay in November, 1878, in charge of the barque *Courier*, and speaks of the anchorage in the N.W. corner as being of very doubtful utility.

Port Constantine, at the head of Astrolabe Bay, is about 2 cables in diameter, with anchorage in about 28 fathoms two-thirds of a cable southward of the North point, which is in lat. 5° 29′ 53″ S., long. 145° 46′ 8″ E.

Cape Croisilles, a well-marked promontory, lies 10 or 11 miles North of Cape Duperré.

After passing Cape Rigny, the *Basilisk* steered about N. by W. ½ W., passing mid-channel between Cape Croisilles and Dampier Island, thence along the N.E. coast of New Guinea, outside Vulcan Island and the Schouten Isles, calling in at Humboldt Bay; after which a course was steered to pass about 20 miles northward of Cape D'Urville, and North of the Mysory Islands, close South of Providence Island, through Dampier and Pitt Straits, to Amboyna.

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* An interesting paper by Mr. W. Powell, "Visits to the Eastern and North-Eastern Coasts of New Guinea," will be found in the "Proceedings of the Royal Geographical Society," September, 1883, pp. 505—514.

Long Island, in lat. 5° 20′ S., long. 147° 10′ E., is divided by a deep valley into two parts. The southern portion rises to a high conical peak, about 4,000 feet high, which D'Urville named *Cerisy*; the northern consists of three peaks grouped together, and not reaching to quite the same height as the southern. *Reaumur Peak*, at its North end, appears to have been a volcano. A reef extends off the western point of Long Island. *Crown Island*, so named by Dampier, lies about 7 miles north-westward of Long Island, and has rather a level summit, 2,000 ft. high.

Sir R. Rich's Island of Dampier lies to the N.E. of Cape Duperré. It is of a similar nature to those already described, and resembles more particularly Crown Island, but is a little larger and not quite so high.

In the space between Rich and Crown Islands breakers were sighted by Capt. W. Symington, S.S. *Hankow*, March 10, 1877; he placed the position of the centre of the breakers in lat. 4° 55′ S., long. 146° 50′ E., and estimates their extent at about a mile each way.

Dampier Island, which is nearer the coast, being 6 or 7 miles N.E. of Cape Croisilles, is certainly not less than 5,000 ft. high, in the form of a cone, pointed at the summit, but enlarged at the base to 36 or 40 miles in circumference. Although it appeared capable of cultivation, no sign of inhabitants was seen from the *Astrolabe*.

Franklin Bay is 32 miles N.W. of Cape Croisilles, and is limited on the North by Cape Gourdon, which forms a well-marked promontory, though slightly elevated. In general, in proceeding to the westward, the coast sensibly decreases in height.

Vulcan Island is an immense cone, clothed with the most beautiful vegetation, and is not more than 12 miles in circumference. It is tolerably well fixed in position, and nothing can render navigation more simple and easy than these peaks planted on the surface of the ocean, serving as beacons for ships to steer by in passing along an almost unknown coast. At 2 miles to the N.W. of Vulcan Island is Aris Island, very much smaller, but still very high.

Pallas Reef was reported in 1878 by a barque of that name to be situated in lat. 3° 37′ S., long. 145° 40′ E., or about 50 miles from the coast of New Guinea, and the same distance eastward of the Schouten Islands. The *Pallas* passed close to the reef, the depth upon which was estimated at a few feet.

Schouten Islands, which lie off this part of the coast, are eight in number, extending upwards of a hundred miles to the westward, and appear to be uninhabited. They are very high and conical, which denote an igneous origin. Their height contrasts singularly with the low elevation of the land of New Guinea near them. They are covered with wood, and the main land, very low near the sea, is mountainous within. Mr. Powell found good anchorage pretty close to the shore of *Broken Water Bay*. The natives were very timid.

Victoria Bay, on the western side of *D'Urville Island*, in long. 143° 28′ E., was visited and surveyed by Sir E. Belcher, in H.M.S. *Sulphur*, July, 1840.

It is of nearly circular shape, the entrance, about 6 cables wide, being on the N.W. side; it is about 1¼ mile in length, North and South, by about 7 cables in breadth, and has regular depths, varying from 9 to 30 fathoms, over a bottom of tough dark mud, affording a snug and picturesque anchorage. Streams of fresh water abound, and wood is plentiful. The natives were friendly.

At 42 miles West of Bertrand Island, Schouten Islands, is a group of islands and lagoon reefs, westward of *Passier Point*, lying very near the coast, named *Sainson*, *Faraguet*, and *Dudemaine Islands*. The two first are low, and covered with large trees. Dudemaine Island only has a small hill on its western end, of 100 or 200 ft. in height, which may be distinguished at a considerable distance among the surrounding low land.

At this part the belt of low land which lines the coast seems to form a large valley between two chains of very high mountains. This configuration would lead to the presumption that a considerable river would flow through this valley. The coast of New Guinea, beyond these, offers nothing agreeable in its aspect. At one part it rises in steep cliffs, and breakers seeming to extend a mile off the shore. Far in the interior the summits of very high mountains may be seen. At 7 or 8 miles in the interior *Mount Eyries* raises its double peak above the clouds, in long. 141° 15′ E. The *Astrolabe* was drifted within half a league of the land, and from the calm was obliged to anchor before a small cove.

While lying near Mount Eyries, fifteen canoes, each carrying from three to eight natives, put off and surrounded D'Urville's ship. There was not the slightest doubt of their hostile intentions. From this part of the coast the imposing summit of *Mount Bougainville* becomes visible in the West, raising its head a considerable height above the surrounding mountains.

Humboldt Bay, thus named by Capt. D'Urville, lies to the West of this mountain. It penetrates deeply into the coast, particularly to the S.E. Its opening was about 4 miles in width. On one side the *Cyclops Mountains*, and on the other Mount Bougainville, stand like gigantic sentinels, pointing out the entrance to Humboldt Bay to the navigator at the distance of 60 miles. To the West of Mount Cyclops the coast descends with a gentle slope to the beach, and has some landing spots, with points more or less projecting.

Humboldt Bay, in lat. 2° 40′ S., long. 140° 42′ E., may be recognised without much difficulty, *Point Bonpland* on the eastern side being bold, about 700 feet high, and cliffy on its northern side. The *Basilisk* struck soundings in 4¾ fathoms in entering, over a bottom of sand and coral, when the following were the bearings taken:—Point Bonpland, S. 40° E.; Point Caillie, N. 35° W.; and a point at the head of the bay resembling a peninsula, S. 72° W. Close to this position anchorage was found in 16 fathoms. An uneasy swell sets into the bay, breaking heavily upon the beach, which has a wild, dreary aspect. The natives were very dark-skinned, bold, and noisy.

Caillie Point, the North entrance point of Humboldt Bay, is a promontory

500 ft. high, projecting in a S.S.E. direction from the mainland, to which it is joined by a low neck. *Challenger Cove*, at the N.W. part of Humboldt Bay, is formed by Caillie Point and a point 1½ mile to the S.W. of it.

H.M.S. *Challenger*, in February, 1875, anchored in 19 fathoms, with Caillie Point bearing N.N.W. ¾ W., distant about 1½ mile, but the swell from the northward causing the ship to roll considerably, an anchorage was obtained in Challenger Cove, in 36 fathoms, stiff clay, with the South extreme of Caillie Point bearing E. ¾ N.; Observation Islet, South, distant 1½ cable; and Village Islet, S.W. ¼ S.; but the northern part of Challenger Cove appeared to afford a better anchorage, being landlocked, with apparently no sign of shoal water; it was, however, not examined.

Matterer Bay, which lies about 42 miles westward of Humboldt Bay, is rather deeper than any preceding. To the West of this inlet a low point, covered with trees, *Point Brama*, projects considerably to the N.W.; and beyond the coast again recedes, forming *Walckenaer Bay*. In the rear of these is a high mountain *(Mount Benoist)*. At 50 miles to the West is another lofty chain, to which D'Urville gave the name of *Gauttier Mountains*, after the great French hydrographer. Mr. Powell says the coast between Humboldt Bay and Point D'Urville is for the most part high, rocky, and rugged, though much broken into bays and creeks, but parts (and these appear to be the mouths of streams) are low and swampy, having thick forests of mangrove bushes.

"In front of, and at 2 or 3 miles distance from, the low beach in front of the Gauttier Range, several small islands followed each other. The largest, Merat Island, is not more than 3 or 4 miles in circumference. At the distance we passed them, about 3 miles, they appeared to be covered with clumps of cocoanut and other trees. At 20 miles farther are the *Arimoa Islands*, three small islets; when 12 miles distant they appeared as a single island, moderately elevated and well wooded. The chain of the Gauttier Mountains here terminates on the coast. Farther to the West the land of New Guinea is very low, and can hardly be distinguished at the distance of 12 or 15 miles. The great *River Ambernoh* or *Rechussen*, debouches here, forming a large delta, and sending a large volume of turbid water into the sea.

"I consider, then, that it is a positive fact that these waters proceed from some considerable river, which discharges itself into the sea on this part of the coast. Bougainville observed the same thing in this part, and from it drew the same deduction. Precisely in this part of New Guinea the land forms a low point, Point D'Urville, very far advanced into the sea, and everything tends to the belief that it is formed by the outlet of a considerable stream."—*M. D'Urville.*

Point D'Urville is very low and projecting, probably islands; according to the observations made in the *Astrolabe* by M. Jacquinot, it is in lat. 1° 24′ S., long. 137° 47′ E. *Stephen Islands* are placed in lat. 0° 20′ S., long. 137° 35′ E., a doubtful position.

LOUISIADE ARCHIPELAGO.

This range of islands and reefs was most probably discovered by Torres, in 1606, though the credit of this has generally been attributed to Bougainville.

Of the *northern side* of this archipelago our first authority is the operations of the *Recherche* and *Esperance*, under the orders of Contre-Amiral D'Entrecasteaux, June, 1793, an examination concluded just previously to the death of that navigator, July 20, 1793. Of the South coast we have now a better knowledge. It was examined, cursorily, by Bougainville, afterwards surveyed by D'Urville, in the *Astrolabe*, in 1840, and still more exactly by Captains Stokes, Blackwood, and Stanley, and Lieut. Yule, in the *Rattlesnake* and *Bramble*. The discovery of the new passage across the reefs at Teste Island was made, as before stated, by Capt. Moresby, and Lieuts. Dawson and Mourilyan, in 1874, who also determined the nature of the D'Entrecasteaux Islands.

ADELE ISLAND is the easternmost extreme of the Louisiade Archipelago, and is one of the most important points as to its position. It was discovered by Capt. Ruault-Coutance, of the French ship *Adèle*. This small island was seen, and its situation determined, by Captain Stokes, lat. 11° 29′ 50″, long. 154° 26′ 10″. It is a coral bank of 500 or 600 yards in diameter, surmounted by a tuft of trees, and surrounded by a reef, which joins on to Rossel Island, a distance of 7 miles, in a N.W. by W. direction. It must be the *Island of Satisfaction* of Capt. Bristow.

Rossel Island, the eastern large island of the Louisiade, is 22 miles long E. by N. and W. by S., and 10½ miles wide in the centre, near which is *Mount Rossel*, nearly 3,000 ft. high, in lat. 11° 20′ 30″ S., long. 154° 8′ E. The island is thickly wooded, and inhabited by a race of cannibals.

Cape Deliverance, the easternmost cape of Rossel Island, is low, and was thus named by Bougainville. It is in lat. 11° 23′ S., long. 154° 18′ 30″ E.

A chain of reefs extends from the West point of this island for 16 miles, to within 10 miles of Piron Island. Thence it trends 4½ miles to N.E. by N., and then E. ½ N. 30 miles, when it turns to the southward, closing the shore at about 6 miles N.W. of Cape Deliverance. No openings were seen through this reef to the lagoon within, except at its West end. There is supposed to be a navigable channel between Rossel and Sud-Est Island.

Sud-Est Island, the largest of the archipelago, is 40 miles long E. by S. ½ S. and W. by N. ½ N., averaging only 8 miles in breadth. It is lofty, and near the centre is *Mount Rattlesnake*, 2,689 ft. high. The island is well wooded, and is inhabited. At 6 miles N.E. of *Cape Sud-Est*, the S.E. extreme, a barrier reef appears to commence, and thence sweeps around the cape, and trends 21 miles to the westward to *Johnston Pass*, a deep channel, 1½ mile wide. Thence the barrier reef trends 16 miles westward to *Smith Pass*, three-quarters of a

mile wide, 16 miles S.W. of Mount Rattlesnake. From Smith Pass the barrier reef extends 15 miles W. ½ N., and then N.W. by W. ½ W. 24 miles to the reef awash lying 16 miles eastward of Duchateau Islands; the last 10 miles consisting of detached patches with foul ground between.

Between this barrier reef and the South coast of Sud-Est Island and the Calvados Chain, there is good sheltered anchorage in 12 to 20 fathoms, but great caution is required to avoid the innumerable coral patches.

Piron Island, 11 miles N. ½ W. from Mount Rattlesnake, and covered with cocoa-nut trees, is surrounded by a barrier reef, at the N.E. extreme of which is *Bramble Pass*, 2 cables wide, leading into *Coral Haven*, a secure harbour within the reefs, but thickly studded with coral islands and reefs. The tide runs with great velocity through the pass. The natives here are fierce and warlike.

From hence to the westward extends a chain of high inhabited islands, of which the first and largest is *Joannet*. Between this and *Real Island*, 45 miles to W. ½ S., is the *Calvados Chain*, from 4 to 10 miles northward of which is a barrier reef, with some small islets on it.

At 8½ miles S.S.E. of Real Island are *Duchateau Islands*, three in number, low and wooded, and not permanently inhabited. There is anchorage in 17 to 19 fathoms, sand and shells, at half a mile northward of it. *Jomard Islands*, 13 miles to the westward, are low and lie on the East side of *Jomard Entrance*, a deep clear channel, 3 to 4 miles broad, between them and the reef enclosing *Bramble Haven*.

Bramble Haven is a lagoon about 10 miles long East and West, enclosed by an atoll reef, on the northern edge of which are five woody islets named Duperré. The only safe entrance is at the S.W. corner; it is three-quarters of a mile wide, with 7 to 10 fathoms. Within there is very secure anchorage in 6 to 20 fathoms; and vessels can here refit or procure wood from the islets, which are not permanently inhabited. H.M.S. *Beagle* when hove-to off Bramble Haven in June, 1879, was set South 30 miles in 12 hours.

At 2 miles westward commences *Long Reef*, extending towards Ouessant Island, a distance of 36 miles to the West. For 20 miles it forms an atoll reef, the lagoon being narrowest near the centre. *Kosmann Islet* lies off the N.W. extreme of the atoll, and about 1 mile N.W. of it there is anchorage in 6 fathoms. It is not inhabited, and firewood may be obtained here. *Ouessant Island* is low and wooded, lying on a reef, and at 7½ miles W.N.W. of it are *Stuers Islets*, three reefs nearly occupying the space between. *Imbert Islet* lies 10 miles N.E. by E. ½ E. of Stuers Islets. *Suckling Reef*, the S.W. extreme of the archipelago, lies 7½ miles W. by S. ½ S. of Stuers Islets, and is 3½ miles long East and West, and covered at high water.

At 16 miles N. by E. ½ E. from Bramble Pass (above) is the South end of a reef, which thence extends 6 miles to W.N.W., according to the chart, with two islets on its western end. Between this reef and St. Aignan Island, are

the *Renard* or *Fox Islands*, their West point being in lat. 10° 54′ S., long. 152° 58′ 30″ E. A bank extends from their western point. D'Entrecasteaux passed to the West of them, and mentions the appearance of a shoal, but which was occasioned by overfalls.

Renard Group consists of eleven small islands, surrounded by fringe reefs. The westernmost island, the largest of the group, is about 500 ft. in height, and has several conspicuous grass-covered peaks upon it. The other islands of the group are low and densely wooded.—*Lieut. Richards.*

St. Aignan Island is about 25 miles in length, East and West, and is next in order to the N.W. of Renard Islands. Captain Bristow calls it *Eruption Island.* It is surrounded by very steep rocks, behind which rise, nearly perpendicular, very high mountains, covered with wood, the highest, near its West end, reaching to 3,300 ft. The North coast is very steep-to. *Cape Henry* is its eastern point, in lat. 10° 43′, long. 152° 49′. Several low islands lie S.W. of St. Aignan Island.

H.M.S. *Renard*, in October, 1879, anchored in 13 fathoms, sand and coral, in a small bight on the East side of the large bay in the middle of the island, which is open to winds from West through North to N.E. Good water was abundant, and a few yams and taro were procured from the natives, who were quite friendly.—*Lieut. Richards.*

Deboyne Islands, flat-topped and thickly wooded, lie 6 miles S.W. by W. from the West extreme of St. Aignan Island. A conspicuous hill, about 1,500 feet in height, rises from the centre of the largest island. The coasts are cliffy, with apparently deep water close to; reefs extend off the West side of the group to a group of small islands. Their North point is in lat. 10° 39′ 5″ S., long. 152° 16′ 30″ E.

Bonvouloir Islands and *Reefs*, appearing to extend in a slight curve about 20 miles N.W. and S.E., were seen by D'Entrecasteaux. *East Island*, 500 ft. high and densely wooded, lies about 22 miles W.N.W. of St. Aignan Island. H.M.S. *Renard*, in 1879, anchored in 17 fathoms, broken coral and sand, at about a quarter of a mile from its N.W. side. The surface current was setting westward at 2 miles an hour, a strong under-current setting East. The natives were friendly, yams and apples being obtained in exchange for hoop-iron, &c. *Hastings Island*, 10 miles farther W.N.W., with a breaking reef between, is about 400 ft. high and densely wooded. A bank, three-quarters of a mile broad, lies off the N.W. extreme, and at 5 miles to the N.N.W. is a group of three or four islands, all connected by a reef.

Conflict Group.—H.M.S. *Conflict*, in 1880, passed through the group of islands reported to have been seen from H.M.S. *Cormorant*, in 1879, in lat. 10° 46′ S., between the meridians of 151° 38′ E. and 151° 54′ E., and (by moonlight) 22 islets were counted from the masthead; the *Conflict* ran for 7 miles along the edge of a barrier reef extending East and West, apparently forming the southern part of the group. At the eastern part of this group

the flood stream was found setting to the eastward and at the western limit it set to the westward.—*Lieut. Bower.*

Emerald Reef.—An extensive reef was discovered by H.M.S. *Emerald* in lat. 10° 36¾′ S., long. 151° 35½′ E., where a depth of 7 fathoms was struck. From this position one portion of the reef extended N.N.W. for about 4 miles, and the other East for probably a much greater distance. Numerous tide rips prevented the limits of the reef being clearly defined, but just westward of the depth of 7 fathoms, it appeared to be nearly awash.—*Capt. Maxwell*, 1881.

D'ENTRECASTEAUX ISLANDS were seen from a distance by the navigator after whom they are named; and, upon further examination by Capt. Moresby, R.N., in 1874, were found to consist principally of three islands, divided by narrow straits. The natives, who are numerous, acted in a most friendly manner to the officers and men of H.M.S. *Basilisk*. The islands extend in a N.W. and S.E. direction for 85 miles, and were named Normanby, Fergusson, and Goodenough. The latter island is divided from New Guinea by Ward Hunt Strait, the other straits being named Moresby, Dawson, and Goschen, the latter lying between East Cape of New Guinea and Normanby Island. The passage through it is described presently.

Normanby Island is 39 miles long N.W. by W. and S.E. by E. *Cape Ventenat*, its S.E. extreme, has a reef extending westward from it to within 2 miles of Gallows Reef, thus forming the entrance to Goschen Strait (see p. 943). *Cape Provost*, its S.W. extreme, lies 8½ miles N.N.E. of the East Cape of New Guinea. Thence to the northward the western coast of Normanby Island, unless anchorage is required, should not be approached to within 8 miles.

The northern mountain of Normanby Island rises in the form of a blunt cone, with a small double notched summit 3,374 ft. above the sea level. *Observation Islet*, situated in lat. 9° 43′ 53″ S., long. 150° 44′ 43″ E., bears N.W. by N. ¾ N., distant 4 miles from Cape Deedes. The islet is small, steep, rocky, and thickly wooded, connected with the shore by a reef.

Dawson Strait, dividing Normanby from Fergusson Island, was not sounded or closely examined, but Capt. Moresby was of opinion that navigation through it would be dangerous and intricate.

Anchorage was found by the *Basilisk*, on the northern coast of Normanby Island, at 2½ miles eastward of *Cape Dawson*, its northern point, and about a cable south-eastward of a projecting tongue of coral, which has a black-headed rock, dry at all times of tide, showing upon its northern centre. Near this anchorage a small stream of *excellent water* discharges itself into the sea, and no difficulty was found in procuring a large supply. Abundance of wood of a description suitable for mixing with coal for steaming purposes was cut. The natives were shy.

Fergusson Island, 30 miles long East and West, and 24 miles broad, is thus described by Captain Moresby:—"We left the ship in Dawson Straits, and

steaming to the westward we passed close under the high volcanic mountains of Fergusson Island which bound the strait to the North. The shore that we coasted was dotted with villages high on the hills, peeping through the sombre tropical green. Turning the western point of Fergusson Island, we found ourselves at the entrance of a fine strait separating Fergusson from Goodenough Island. Both these islands, with their forests topped by bare grey peaks, are grandly picturesque objects, *Mount Goodenough* rising magnificently to a height of nearly 8,000 ft. The sides of this great mountain are cultivated in patches to a height of 2,000 ft.; gradually its woods give place to barrenness, and its summits stand bare and knife-edged against the sky. Mountain torrents dash down its ravines and flash out at times from their dark-green setting, like molten silver."

Cape Mourilyan, the S.W. extreme of Fergusson Island is bold; northward of it is *Seymour Bay*, which was not examined.

Moresby Strait divides Fergusson from Goodenough Island, and is about 20 miles long, North and South, by 3 miles broad, but narrowed to a mile by Frith and Markham Islands with their off-lying reefs. Its navigability was not thoroughly ascertained, but its principal features appeared similar to those of Goschen Strait, namely, great depth, with precipitous mushroom coral patches.

Goodenough Island, the western of the D'Entrecasteaux group, is about 24 miles long N. by W. and S. by E., and 12 miles broad. Its summit, Mount Goodenough, is previously described. The natives were friendly.

Cape Ryley, the S.W. extremity of Goodenough Island, appeared bold and steep, with small, sunken coral patches about a cable from the shore. *Cape Rawlinson*, the western point of Goodenough Island, 5½ miles N. by W. ½ W. from Cape Ryley, is abrupt and bold, but a sunken coral reef was seen extending from it in a W. by S. direction, about 3 miles.

The West coast of Goodenough Island takes a N.E. by N. direction from Cape Rawlinson, and appears to maintain its bold, precipitous nature.

WARD HUNT STRAIT, formed between Cape Vogel and Goodenough Island, is about 22 miles long by 15 miles broad. No set was experienced in this strait, and at springs the tides are probably much weaker than in Goschen Strait; this would lead to the supposition that the waters are deep throughout, and not narrowed and confined like those of the latter strait by detached coral reefs and patches. The rise and fall near Cape Vogel was estimated to be 6 ft.

Goulvain Island lies at the eastern entrance of Dawson Strait. It has a brown, bare-looking summit, and is about 2 miles long, North and South, by about 2¼ miles broad. Its shores were not examined, but it is inhabited, as many canoes were seen to put off from its shores. *Welle Island*, about 10 miles north-eastward of it, and vastly superior to Goulvain Island in size, is low, and breakers extend a considerable distance S.E. of it. To the N.E. of Welle

Island, 17 miles distant, is a small islet, to the N.N.W. and westward of which are several others, but this part has not been examined.

Trobriand Islets lie to the North of the D'Entrecasteaux group. The S.E. point of *Lagrandière Island*, the south-easternmost, is in lat. 8° 52′ 30″, long. 151° 12′ 30″ (approx.). They are low, and of considerable extent. *Jurien Island* is somewhat higher than the others; at 20 miles to the E. by S. of it is *Jouvency Island*.

Cape Denis, in lat. 8° 24′, long. 151° 6′, is the N.E. point of Trobriand Islands. Capt. Hunter, of the ship *Marshall Bennett*, recommends Cape Denis as an excellent place to secure a good supply of yams.

To the West of Cape Denis is *Cape North*, the extremity of some low islands, which appear to be the westernmost land. Beyond this is a line of coral reefs, which were called the *Lusancay Reefs*. They extend to a very considerable distance; and indeed are more or less connected with a range of coral barrier reefs extending to the meridian of 148° 30′. This extensive line runs nearly on a parallel, and partakes of all the dangerous characteristics of the coral reefs—perpendicular borders, and detached outlying shoals, one of which D'Entrecasteaux particularly notices. It forms the North side of a series of islands and reefs, enclosing the largest known lagoon in the world, measuring about 3° of longitude in length and $1\frac{1}{4}$° of latitude in breadth.

Laughlan Islands, a group of *nine* islets, extending 5 miles East and West, and nearly as much North and South, including the surrounding reefs, were discovered by Capt. Laughlan, in the *Mary*, in 1812. Two of the largest of them are at most about $1\frac{1}{2}$ mile in extent; the land is only elevated a few feet above the water level. According to D'Urville, the eastern point is in lat. 9° 19′ 3″ S., long. 153° 48′ 40″, but the chart places it in 153° 41′. In January, 1880, 18 Europeans landed here, from the vessel which took out the ill-fated emigrants, who were to form the settlement of Port Breton, New Ireland, previously mentioned.

Cannac Island, discovered by D'Urville, lies 9 miles West of Laughlan Islands, and is a rock of 200 or 250 ft. in height. It is in lat. 9° 18′ S., long. 153° 28′.

WOODLARK ISLAND (*Mayou*).—The discovery of this island is attributed by Captain R. L. Hunter to Captain Grimes, of the *Woodlark*, of Sydney, prior to September, 1836. Captain Hunter gave the first intelligence to the world of its existence; he saw it in the ship *Marshall Bennett*, Sept. 27, 1836. He says it is probably narrow, in a North and South direction, with small islets lying off the South side. The North side is bold to approach, and clear of danger, extending about 40 miles East and West. It is of moderate height, with some hills in the interior, the highest being of a remarkable sugarloaf shape. There are one or two bays on this side, and on

the western side of the deepest one was an entrance of a small inlet or river; but it was not examined. This is the sum of the information given by Capt. Hunter, who places its eastern end in lat. 9° 9′ S., long. 153° 5′ E.; and the western end in lat. 8° 53′ S., long. 152° 24′ E.

In 1879, H.M.S. *Renard* anchored in 10 fathoms, about 60 yards from the beach, in *Richards Bay*, on the North coast, but it would be unsafe in the N.W. monsoon. The watering place was in lat. 9° 8′ S., long. 152° 51′ E. Outside the reef in the bay next westward there is 10 fathoms at a quarter of a mile from the shore, probably better temporary anchorage than in Richards Bay. The coast is high and densely wooded. The natives are Papuans, and appeared friendly and unarmed, speaking a few words of English. Some yams, pumpkins, and one or two pigs were obtained, tomahawks being used in barter. Good fresh water abounds.

The following information was given (May, 1848), to M. Dutaillis by Lieutenant-Commander Marceau, of the French ship *Arche d'Alliance*:—The whole of its southern part is bestrewed with small islands, connected with each other for the most part by coral reefs, between which there exist several passages. Capt. Rabalau, of the brig *Anonyme*, belonging to the Société Catholique, brought and landed Monseigneur D'Antiphelles at *Garupe*, the South port. The banks are very steep-to. The two passes to the East and West of the islet *Elaue* are very good; the currents are pretty strong in them, and throughout the road sand is found, with ordinary holding ground.

Guasap.—There is anchorage in 10 fathoms, 4 cables N.W. of the West end of *Wavi-ai Island*, a low and wooded coral island, the North side of which is in lat. 9° 10′ 30″ S., long. 152° 53′ 30″, according to Mr. N. G. Arguimbau, H.M.S. *Iris*, 1858. The entrance between the reefs is narrow and dangerous, at half a mile S.W. by W. of the West end of Wavi-ai.

Marshall Bennett Islands, three small and high islands to the E.S.E. of Jouvency Island, were announced by Capt. R. L. Hunter, of the ship whose name is here given. The positions are:—The easternmost, lat. 8° 50′ S., long. 152° E.; middle, lat. 8° 49′ S., long. 151° 56′ E.; and the westernmost, lat. 8° 46° S., long. 151° 52′ E.

Evans Island, seen in 1841, is surrounded with islets and reefs, in the middle of which, a whaling captain assured M. Dutaillis that there was a good anchorage. Its position was in lat. 9° 10′ S., long. 151° 55′ E.

PASSAGE THROUGH THE LOUISIADE ARCHIPELAGO.—The route of H.M.S. *Basilisk* proved that the Louisiade Reefs, formerly thought to form an impenetrable barrier between Australia and N.E. New Guinea, present in reality a wide open gateway through which vessels may pass, and decrease the distance by 300 miles between Australia and China. During the N.W. monsoon, however, it would probably be a difficult passage for a sailing vessel.

We first describe briefly the *main features* of the route, and afterwards give Capt. Moresby's directions.

Teste Island, 2½ miles long East and West, has two peaks, one at each end, 500 ft. and 470 ft. high. It is surrounded by reefs to a distance of half or three-quarters of a mile. The village is situated on the southern side, and appeared to be well populated. A native missionary resides on the island. A few fish, yams, and cocoa-nuts are procurable, in exchange for iron hoop, red handkerchiefs, and fish-hooks. Anchorage was found in 16 fathoms, sand, off the shingle beach on the North side of the island, about a cable's length from the shore, with Boat Rock bearing W. ½ S. With northerly winds this anchorage would be exposed and unsafe. There are three small rocks or islets on the reef, in close proximity to the western side of Teste Island, and one on its S.E. side. At the West extreme of East Islet is a lagoon about 2 miles long, with good sheltered anchorage near the entrance, which has a rock in its centre.

H.M.S. *Emerald*, in 1881, anchored on a bank of 8 fathoms, with the right extreme of Teste Island bearing North, and West Islet W. ¾ S. The tidal streams here ran N.N.E. and S.S.W. at a rate of 4 knots an hour at springs.

Bell Rock, N.W. by W. ½ W., 2 miles from Teste Island, is 420 ft. in height, and affords an excellent mark from all directions. *Lebrun Islets* are two in number, N.W. ¾ N. 4½ miles from Bell Rock. Both islets appear conical from all directions, their heights being about 350 and 150 ft. *Stuers Islets* (two) are of coral, low and woody, 9¾ miles S.E. ½ S. from Teste Island. In smooth weather temporary anchorage may be found off the southern edges of the detached reefs lying S.E. and S.W. of Stuers Islets. *Imbert Islet* is small and woody, and lies E. by S. 13¾ miles from Teste Island. *Foolscap Rock*, taking its name from its appearance, bears N. by E. ¾ E. 7¼ miles from the East point of Teste Island; it is about 150 ft. high, and accessible only on the South side. Temporary anchorage may be obtained on the bank extending N.W. of it. *Bentley Island*, 350 ft. high, bears N.E. by N. ¼ N., 9½ miles from Foolscap Rock; it is of peculiar shape, and in many respects unlike the other islands in the locality. *Mudge Island*, lying S.E. by E. ½ E., 4 miles from Bentley Island, is low, of coral formation, and thickly wooded. It is uninhabited.

Engineer Group, 6½ miles eastward of Moresby Island, consists of four islands, curving in an E.S.E. and W.N.W. direction; and between these and the small islands S.E. of Moresby Island is the main route to Goschen Strait, at this part about 5 miles wide. *Slade Island*, 1¾ mile long N.W. and S.E., and 596 ft. high, is the north-western and most conspicuous of the Engineer group. *Butchart Islet*, connected to the North point of Slade Island by a coral reef, is small, and rises to a well-marked hill, about 350 ft. high, near its northern end. *Skelton Island* is separated from Slade Island by a channel 3 cables wide, near the centre of which, but rather nearer Slade Island, is a

black rock, about 20 ft. high. *Sandfly Bay*, on the West side of Skelton Island, affords a confined anchorage, but is sheltered in S.E. winds. Care should be taken not to shoal less than 15 fathoms, as the shore reef which fringes the bay shoals rapidly. A village is situated at the head of the bay. *Watts Island*, the south-eastern of the Engineer group, is rather more than 2 miles long East and West, by 600 yards in breadth. The summit, about 400 ft. high, near the western end, is well defined and thickly wooded. The channel between Skelton and Watts Islands should not be used.

To the north-eastward of the Engineer group are a string of six small coral islets, similar in appearance, and thickly wooded. The space between these and the Engineer group is generally deep, but beset in parts with patches of coral, rising perpendicularly from the bottom.

Haszard Islets, 4 miles eastward of Watts Island, are two in number, and connected by coral reef. The tides in this vicinity run at the rate of 2 knots at springs; ebb to the South, flood to the North. Five separate patches of discoloured water were seen between Haszard Islets and Hardman Islets (to the northward).

Blakeney Islet, low and wooded, bears N.E. easterly, 10 miles from Shortland Islet, and occupies a central position in the main route to Goschen Strait when approaching from the southward. Anchorage in 23 fathoms, sand and coral bottom, was found on its western side, about 2 cables off shore; also in 8½ fathoms, white sand, off the N.W. side, with the centre bearing S.E. ½ E., distant a quarter of a mile, or just eastward of the sand spit that extends from the N.W. side. In the vicinity of Blakeney Islet the flood stream sets N.W., the ebb S.E. *Hardman Islets*, two in number, are low, thickly wooded, and of coral formation. They lie E. ¾ N., 5¼ miles from Blakeney Islet. *Laseinie Islands* are six in number. The largest, named Dawson Island, 450 ft. high, bears N.E. by E. ¾ E. easterly from the western Hardman Islet, distant 6⅓ miles, shoals appearing to extend between them.

Hull Islet bears N.W. 3¼ miles from Blakeney Islet, and, like that islet, is low, woody, of coral formation, and oval shape. *Grace Islet*, similar in appearance, bears N.W. by W. ¼ W., 4⅓ miles from Hull Islet. *Cocked Hat*, 50 ft. high, bears W.S.W. 1¼ mile from Grace Islet. Coral reefs extend westward 1¾ mile from it.

Gallows Reef is an extensive, horseshoe-shaped ridge of coral, the greater part awash, blocking up a space 6 miles long East and West, by 3¼ miles broad, near the centre of the eastern entrance to Goschen Strait. On its N.E. arm are two small islets, named Jack and Ketch. Caution should be used in approaching this part of Goschen Strait, as the tides set strong in the vicinity, and the lead gives no warning of the approach to dangers.

Lydia Island, the summit of which, 1,038 ft. above the sea level, affords a prominent mark in approaching Goschen Strait, is about 3 miles long. A small bay on its North side affords anchorage in 19 fathoms in its S.W. corner,

but within half a cable of the edge of the coral reef, which, rising abruptly, borders the shores of the bay. *Stanwell Island* is small, hilly, and separated from the N.E. part of Lydia Island by a narrow channel.

Gibbons Island lies S.E. ¾ E. 2¼ miles from the summit of Lydia Island. It is conical, and 385 ft. high. Approached from the southward, its bright green summit is seen from a considerable distance.

Parallel to Gibbons and Stanwell Islands, and to the eastward, a detached bank of sunken coral extends 2¼ miles in a N.N.W. and S.S.E. direction, having upon it depths of from 6 to 12 ft. Between it and the above-mentioned islands is a channel about three-quarters of a mile broad, through which H.M.S. *Basilisk* passed on several occasions, but it is not as good as the channel of the main route north-eastward of the Gallows Reef.

Obstruction Islands take their name from the position they occupy, blocking the passage between Lydia Island and East Cape. They are three in number, the middle one being highest and most conspicuous. The space between East Cape, Lydia Island, and Obstruction Islands, abounds in coral reefs and foul ground, and should be carefully avoided.

Flounder Reef is a detached coral patch, 3 cables in extent, having a depth of about 12 ft.; from its centre, Lydia Island summit bears S.W. ¼ S., distant 2½ miles. This danger can generally be detected at a distance of 1½ mile, unless the weather be calm, and the sun low.

GOSCHEN STRAIT is formed between the South coast of Normanby Island on the North, and the East Cape of New Guinea, Lydia Island, and Jack and Ketch Islets, with Gallows Reef, on the South. It is about 16 miles in length, East and West, and varies in breadth from 2 to 6 miles. On its northern shore the Prevost range of mountains, upwards of 3,000 ft. in height, and covered with dense tropical forests, descends in steep slopes to the water's edge, being intersected by numerous ravines. About the centre of this range, or nearly midway between Capes Prevost and Ventenat, a remarkable dip or gap occurs, the position of which is accurately placed upon the chart, and will be found an unmistakeable mark for fixing a vessel's position in cloudy weather, when passing through the strait.

It is high water, on full and change, in Goschen Strait, at about 8^{h}. The rise and fall is apparently not more than 5 ft. The ebb sets to the eastward, the flood to the westward. The ebb appears the stronger tide, attaining at springs a rate of 2 knots an hour.

Ventenat Islands are small and woody, but with well-marked summits. They bear S.W. ¾ S. and S. ¾ W., from Cape Ventenat, the South Cape of Normanby Island, and are each distant from that cape about three-quarters of a mile. A barrier reef of sunken coral skirts this part of the coast of Normanby Island, outside of Ventenat Islands, curving gradually to the N.E., and having depths from 5 to 18 ft. upon it. Its S.W. extremity (*Grind Reef*), between which and Gallows Reef is the broadest passage through Goschen

Strait, has a depth upon it of 15 ft., and bears N.E. ½ E. from Jack Islet, distant 2¾ miles, and N. ¼ W. from Ketch Islet, distant 2 miles.

Centipede Bay, 2¾ miles N.W. of Cape Ventenat, is a bight open to the southward, and affording deep water anchorage for a steam-vessel. Anchorage was obtained by H.M.S. *Basilisk* in 26 fathoms, stiff muddy bottom, about a cable from the shore, and a quarter of a mile from the eastern end of the beach. Westward of this position no bottom could be obtained at 40 fathoms. Large quantities of yams, &c., were easily procured for iron-hoop.

DIRECTIONS.—Vessels from the S.E. coast of Australia bound to Goschen Strait or to the eastern islands of New Guinea, will do well to pass westward of Cato, Wreck, and Kenn Reefs, and eastward of Saumarez and Frederick Reefs. Care should be taken to make Teste Island by day, and if within 60 miles, and overtaken by night, the navigator should shorten sail until daylight, as the current was found in the month of February, during a strong westerly gale, to set E.N.E. 2½ knots an hour, or directly on to the reefs southward of Teste Island. Both Bell Rock (420 ft. high) and Teste Island afford good land marks, as the latter can generally be seen at a distance of 18 or 20 miles. From the southward, Teste Island first appeared as three or four detached islands, and on nearer approach two remarkable trees were seen on one of the ridges; but if the weather be thick, Stuers Islets, which are low and woody, may be the first land sighted; and it is possible that the high land of Moresby Island (1,300 ft. high) may be seen looming in the distance, previous to sighting any of the above-mentioned islands.

Vessels may pass between Suckling Reef and Stuers Islets, and across the sunken barrier in from 9 to 10 fathoms, with the high Lebrun Islet on a N.W. by N. ¾ N. bearing. If the vessel have passed to the westward of Suckling Reef, the larger Lebrun Islet should not be brought to bear eastward of North, as the tides and eddies run strong on the bank south-westward of Lebrun Islets. The passage S.E. of Teste Island should be avoided, as a depth of 4 fathoms was here struck, and it has not been sufficiently examined.

Having crossed the sunken barrier, steer to pass about a mile westward of Bell Rock, after passing which, a N.N.E. course should be steered (allowing for set of tide) to pass a mile East of Glenton and Smith Islets; if requisite, anchorage may be found in 9 fathoms on the bank of sand which extends about 2 miles to the northward of Foolscap Rock.

After passing Glenton and Smith Islets, a North course should be steered, and if the weather be fine the West extremity of Slade Island, in line with the West extremity of Bentley Island, is a good mark for continuing upon, until Shortland Island bears S.W. by W. ½ W., or until the southern Hardman Islet is in line with the South point of Dawson Island, bearing N.E. by E. ½ E.: the latter mark will lead clear of the foul ground to the South of Blakeney Island.

When Blakeney Islet bears N.W. by W., a N. by W. $\frac{1}{4}$ W. course will lead up to the passage between Grind Reef and Gallows Reef, care being taken to ascertain the ship's position by cross bearings, as the tides set strong to the East and West in this part of Goschen Strait. When the North point of Lydia Island is seen between Jack and Ketch Islets, and bearing W. by S., southerly, a W. $\frac{3}{4}$ N. course will lead in mid-channel to Goschen Strait between the reefs, clear of danger.

TORRES STRAIT.

TORRES STRAIT, the channel between Australia and New Guinea, as is well known, is of dangerous approach, from the labyrinthine coral shoals which embarrass all its entrances. To describe it in all its intricacies would carry us far beyond the limits of this work, and also would exceed its province, inasmuch as its navigation refers more to the transit from Australia, &c., to the various ports of the Oriental Archipelago and China Seas.

The Great North-East Channel from the Gulf of Papua passes between Bampton Island, on New Guinea, and Darnley Island, on the Barrier Reef. In the centre of this opening is Bramble Cay, to the S.E. and South are Anchor Cay and Darnley Island, and between them is Bligh Entrance. To the south-eastward of these is Flinders Entrance, which passes to the northward of the Murray Islands.

From the reef outside these islands, the outer edge of the Great Barrier Reef is continuous, with few exceptions, to Raine Island Entrance, one of the principal northern entrances to Torres Strait. All these will be briefly alluded to.

Although much has unquestionably been done to render the passage through Torres Strait less dangerous than formerly, by the erection of a beacon on Raine Island, to lead vessels into the best channel through the Great Barrier Reefs, and by the careful survey of the approach to the main land; yet, owing to the strong N.W. current outside the barrier, and the heavy weather, especially at full and change of the moon, vessels might possibly be drifted past the beacon, and the various entrances between the parallels of 19° 15′ and 11° 25′ S.; in this event it is satisfactory to know that the Bligh Entrance of the Great North-East Channel, broad, safe, and clear, exists for a vessel to run for, where there is room to lay during the night, or find anchorage under the lee of the reefs.

Since Capt. Denham's survey of the Coral Sea, many vessels have adopted the Great North-East Channel in preference to Raine Island, or either of the adjacent passages to the southward. And as the Great North-East Channel

becomes more frequented, its safety and other advantages will doubtless be so well known as to cause it to be recognised as the principal route from the Coral Sea to Torres Strait.

BLIGH ENTRANCE, the best approach to the Great North-East Channel from the Coral Sea, is a clear space 18 miles broad, between Anchor and Bramble Cays, with regular soundings, from 13 to 40 fathoms, coral sand, and in some parts mud.

Bramble Cay (*Massaramcoer*) is a small sandy islet, in lat. 9° 7′ 50″ S., long. 143° 52′ 10″ E., and N. ¾ E. 28½ miles from Darnley Island; it is about 10 ft. above the level of the sea, and being visible at a distance of 7 or 8 miles from a vessel's deck, is one of the best marks for making the Great North-East Channel from the northward. A reef surrounds it, and *Nautilus Reef* lies 2 miles N.E. by E. ½ E. from the centre.

Darnley Island (*Erroob*), the principal guiding mark for the Great North-East Channel into Torres Strait from the eastward, is of volcanic formation, and about 5 miles in circumference. Its highest part is a peak rising from the western portion of the island to a height of 610 ft., in lat. 9° 35′ 20″ S., long. 143° 45′ E. Some native missionaries reside here.

The PAPUA, or GREAT NORTH-EAST CHANNEL, extends S.W. ½ S. nearly 100 miles in a direct line from Bramble Cay, in its N.E. entrance, to Harvey Rock, the S.W. termination of the chain of islands extending through the channel. Its greatest breadth is about 35 miles, at its N.E. entrance, between Anchor Cay and the shoal water south-eastward of Bampton Island. This channel being comparatively free from hidden dangers, and so much broader than any hitherto discovered, both in entering from the eastward, and afterwards gaining the main land of Australia, or the western channels through Torres Strait, a vessel has the advantage of being enabled to run through it under all sail, with a leading wind, during either monsoon.

Another strong recommendation to the Great North-East Channel is its southerly direction from the eastward, enabling a vessel to push on at all hours of the day, unembarrassed by the sun's glare; this, and the direction of the channel also admitting of a passage either way, with a free wind, or nearly so, in either monsoon, besides other great advantages, render this channel unquestionably the best adapted for general navigation, more especially for a ship of great draught, fleets, or convoys.

To vessels which, from stress of weather, or strong currents, have been driven to leeward of Raine Island, or Pandora Entrance, and vessels from the Pacific, it is obviously the route. It is questionable, however, if it will altogether supersede the Raine Island and other southern passages, although only lengthening the route to Cape York about 130 miles.

Nearly all the islands in this channel are inhabited by a warlike and treacherous race, friendly disposed towards Europeans; still caution should be used in dealing with them.

Directions.—A vessel going through Bligh Entrance from the southward and eastward should endeavour to make the entrance on the parallel of about 9° 5′ or 9° 15′ S., passing to the northward of East and Anchor Cays, and by the time she gets into about 25 fathoms, Darnley Island will, in clear weather, be distinctly seen to the southward; and Bramble Cay, from aloft, to the northward. It will be desirable not to make Bligh Entrance to the southward of the latter parallel, in consequence of the sunken reefs lying 5 and 7 miles to the northward of the vegetated sand-bank, north-eastward of Darnley Island; and vessels proceeding to Darnley Island from the northward must keep a good look-out for these dangers.

Darnley Island and Bramble Cay, or either of them, having been identified, and the vessel's position ascertained, a south-westerly course may be steered for Stephen Isle (Hogar), which will soon be seen in that direction; when it is clearly made out, alter course if necessary, so as to pass at about 3 miles to the north-westward of it. Having cleared the spit of foul ground running out W.S.W. 3 miles from Stephen Isle, steer S.W. ½ S. towards Rennel Isle, distant 20 miles, passing 3½ miles to the north-westward of Campbell Isle, and between Dalrymple and Marsden Isles: pass Rennel Isle on the western side, at a distance of about 1½ mile, then haul up to S.W. by S. ½ S., towards the West end of Cocoa-nut Isle (Purremar), distant 21 miles, leaving Arden Isle and Jacobus East Shoal at about a mile on the port beam, and passing between Dove Islet, with the Green Patch to the north-eastward of it, and another low islet to the eastward of Dove Islet. Cocoa-nut Isle will soon be seen from aloft, and is easily distinguished from its neighbours, by the grove of cocoa-nut trees growing upon it.

When at about 2 miles to the westward of Cocoa-nut Isle, and there is sufficient daylight to pass between the Sisters and Long Island—supposing it is intended to go through Prince of Wales Channel—the next course will be S.W. by W. ½ W., for Bet Islet, the northernmost of the Three Sisters, distant 13½ miles; by making good this course, the S.E. points of Dungeness and Long Island reefs will be passed at a distance of about 1¾ mile, the only hidden danger in the route being the reported Jacobus East Shoal and the patch of sunken rocks 3 miles to the north-eastward of Bet Islet, which must be carefully looked out for; the latter may be avoided by keeping Mount Ernest Island its breadth open to the southward of Saddle Isle.

Bet Islet (Burrar) may be passed at about half a mile off its N.W. side, when a S.W. ½ W. course should be made good until Saddle Isle bears N.W. by W., to clear Moresby Rock, in the vicinity of which the tidal stream runs strongly at right angles to the course. Ninepin Rock is steep-to, and may be passed on either side; from it, steer S.W. ½ S. 19 miles for Double Island, which in clear weather will soon be seen from aloft; pass this island on its northern side, taking care to give a good berth to the spit of foul ground running out to the north-westward from the West end of its reef.

From Double Island, Wednesday and Hammond Islands will plainly point out the entrance of Prince of Wales Channel, for which a W.S.W. course may now be steered, and directions for further guidance through the channel to the westward will be found at page 951.

If, on arriving at Cocoa-nut Isle, it is intended to proceed to Cape York, or Endeavour Strait, a S.W. by S. $\frac{1}{2}$ S. course may be shaped for Mount Adolphus, passing about midway between the low islet, lying S.S.W. $4\frac{1}{2}$ miles from Cocoa-nut Isle, and the grassy sand-bank on the East end of Bet Reef. The only known dangers in this track, which has only been slightly examined, are the two reefs with the sand-bank, at 5 miles to the southward of Poll Islet, and nearly midway between Cocoa-nut Isle and Mount Adolphus. The south-eastern of these reefs may be passed on its eastern side, at a distance of half a mile, and Mount Adolphus, which will now be distinctly seen, may be steered for, and passed either to the northward or southward, according to the vessel's destination, taking care to keep a good look-out for the dangers lying off Mount Adolphus Islands.

In going through the Great North-East Channel at night, it would be desirable to deviate a little to the eastward from the direct course between Stephen and Rennel Isles, so as to sight Campbell and Marsden Isles, as it is advisable to borrow a little on the S.E. side of the channel here, to avoid being set by a lee tide stream too near the Warrior Reef, which might happen at night, whilst steering a given course for above 20 miles, without any landmark in sight for the greater part of the distance.

On arriving near Cocoa-nut Isle at nightfall, it would be better to anchor than attempt to pass between Long Island and the Sisters; but should anchoring for the night cause an inconvenient delay, the eastern track, direct from Cocoa-nut Isle to Mount Adolphus, might be adopted, passing to the eastward of the Sisters Reefs. In this case it would be desirable to haul on a wind, on the port tack, after passing the grassy sand-bank on the East end of Bet Reef, to avoid the two reefs with the sand-bank, southward of Poll Islet. And if the wind hang to the southward of S.E., a short board to the north-eastward may be desirable, to counteract the strong westerly set which generally prevails, independently of the tide streams, in some parts of Torres Strait, during the S.E. monsoon.

In following the foregoing courses, due allowance must always be made for the tide streams, and the additional set to the westward, before alluded to.

It is unnecessary to give directions for proceeding through the Great North-East Channel from the westward, as those already detailed for coming from the eastward, taken in inverse order, will answer every purpose. Although this channel is so comparatively free from dangers, an anchor should at all times be ready to let go, and a good look-out kept from aloft.

Tides.—It is high water, on full and change, at the N.E. entrance of the

channel, at $9^h\ 20^m$; springs rise 10 to 12 ft., thus causing a remarkable difference in the appearance of the reefs at high and low water.

Flinders Entrance, although a good one, does not lead to any direct route through Torres Strait; it is therefore only to be recommended as affording the nearest approach to the Murray Islands from seaward, and, perhaps, temporary anchorage to a vessel making the Great Barrier Reefs too late in the day to proceed further before dark.

Remarks.—Vessels from New South Wales, bound to any of the ports in India during the S.E. monsoon—that is, from the month of April to August, inclusive—will find it more advantageous to pass by Torres Strait (taking care to be through by the end of August), as at that time of the year strong westerly winds prevail on the southern coasts of Australia.

In proceeding by Torres Strait, two passages present themselves—one called the *Inner Route*, or along the eastern shores of Australia, within the Great Barrier Reefs, and entering it near Lady Elliot Isle, in about lat. 24° S. The other, the *Outer Route*, by stretching off to the eastward of the Great Barrier Reefs, steering between them and New Caledonia, through the Coral Sea, and then entering Torres Strait by Raine Island or Bligh Entrances, or by either of the various other openings in the Great Barrier Reefs to the northward of Cape Melville.

Opinions are divided as to the respective merits of the two passages; for despatch, the Outer Route is certainly to be preferred: but, under all circumstances, the Inner Route was generally considered the safest.

But it cannot be denied that the Outer Route is much more likely to interest most of the commanders of merchant vessels proceeding from Sydney to Torres Strait, whose chief object is generally to make a quick passage, with the least amount of labour. Notwithstanding all that has been said in favour of the Inner Route, supported by the weighty authority of Captain P. P. King, the Outer Route is unquestionably preferred by more than three-fourths of the merchant vessels bound from Sydney to Torres Strait.

The season for making the passage by either route has been supposed to commence on the 1st of April, and to end with the middle of September, but it is not desirable to be up with the entrance of Torres Strait before the end of March or the beginning of April, in order to avoid the chance of an equinoctial gale, as well as to take advantage of the S.E. monsoon being well set in in the Arafura Sea. Vessels have left Sydney as late as October, and made their passages, yet, generally speaking, it is much too late, for although the N.W. monsoon does not blow home until November, and sometimes later, the calms and light winds that precede it tend to protract the passage.

CAPE YORK, the N.E. extremity of Australia, and the southern limit of Torres Strait, is 123 miles S.W. by S. of Bramble Cay; *Mount Bremner*, its highest part, is 409 ft. high. Endeavour Strait passes to the S.W., close around it, and from the N.W. end of the peninsula extends a line of islands

and shoals, which form the western channels of Torres Strait. To describe these in detail would occupy more space than can be given here, but a reference to the Admiralty survey, combined with the general remarks that follow, will suffice to give a serviceable account of their navigation.

Somerset, the settlement 4¾ miles S.E. of Cape York, was established in 1864. The Government establishment has been transferred to Thursday Island, but a private firm occupies the buildings and sheds for a pearl fishing station. The mail steamers have ceased calling, and it is no longer the head-quarters of the pearl fishery. At *Port Albany*, opposite Somerset, there is also a pearl fishing station. The strong tides prevent sailing vessels visiting Somerset.

ENDEAVOUR STRAIT is the southernmost and most extensive of the western channels of Torres Strait; but it is not to be preferred, on account of the numerous dangerous sunken patches in it.

The eastern entrance of the strait, which is easily recognized by the group of islands lying in it, is 9 miles broad, East and West, between Peaked Hill and Rattlesnake Point, the eastern extreme of Prince of Wales Island.

A vessel from the eastward, proceeding through Endeavour Strait, having passed Mid Rock, between Mount Adolphus and Cape York, and opened Peaked Hill, to the northward of York Island, should steer W. by S., so as to pass at about 1 mile outside that island, from whence a continuation of the same course for 11 miles farther will lead to the entrance of the strait, between Woody Isles and Entrance Island, passing at 1 mile to the northward of Meddler and Great Woody Isles; in rounding the latter, care must be taken to avoid the 3-fathoms shoal lying off the N.E. point of the island.

Although there are several passages into Endeavour Strait from the eastward, that between Woody and Entrance Islands is by far the best, it being broader and deeper than the others, with less strength of tide.

When abreast of the channel between Woody and Entrance Islands, steer S.W. by S. through it, passing Pym Point, the S.E. extreme of Entrance Island, as near as circumstances will permit, to avoid Gibson Rock; continue this course, making due allowance for strong tide streams, until Barn Isle bears E. by S. ½ S., then alter course to W. ¼ S., passing at about 2½ miles to the northward of Red Wallis Isle; by carefully pursuing this course 8 miles farther, it will lead clear out into the Arafura Sea, closely skirting the southern edge of Rothsay Banks. The bottom here being sand, the shoals are not so easily distinguished as coral, it will therefore be necessary to pay great attention to the lead, to avoid the banks and knolls lying between the western extremes of Rothsay and Red Banks, especially one with only 2 fathoms on it at low water, W. by N. 7⅔ miles from Red Wallis Isle; it is recommended to steer to the northward of this knoll, to keep clear of others to the southward of it, and the 2-fathoms termination of Red Banks, lying West 6½ miles from Red Wallis Isle.

Vessels not drawing more than 10 ft., may, when the water is smooth, cross

Rothsay Banks, in 3 fathoms water, north-westward towards Booby Island, by keeping the two Wallis Isles in line.

PRINCE of WALES CHANNEL, the best through the western part of Torres Strait, passes North of Wednesday, Hammond, and Goode Islands, and South of North-west Reef. It is bounded to the southward by Ince Point, Wednesday Spit, Hammond Rock, and Ipili Reef, all of which, with the exception of Wednesday Spit, are excellent guiding marks, and may be passed, in 7 and 8 fathoms water, at one-third of a mile off.

On Ipili Reef a triangular red beacon is placed, and on the N.W. Reef a square black beacon, which bears N.E. from Hammond Rock, and W. by N. $\frac{1}{2}$ N. from Ince Point.

The northern side of Prince of Wales Channel is formed by North-west Reef, the southern edge of which extends $7\frac{1}{2}$ miles in nearly a direct line, from $2\frac{3}{4}$ miles N.W. by W. of Ince Point, to 2 miles N.N.W. of Ipili Reef. It may be skirted in from 6 to 9 fathoms water, within a quarter of a mile, except near its eastern end, and to the northward of Hammond Rock, where spits of foul ground project about one-third of a mile; but this edge of the reef should not be approached within a mile, except when beating through, as the clearest part of the channel lies on the southern side, and some dangerous reefs and sunken patches lie across the northern portion of the western entrance.

A vessel coming from the eastward should shape such a course as to pass at about 1 mile to the North of Ince Point, avoiding *Alert Rock*, of $2\frac{1}{2}$ fathoms, lying $2\frac{3}{4}$ miles E.N.E. of it. Having brought Ince Point to bear South, and the highest part of Double Island E. by N. $\frac{1}{4}$ N., northerly, steer W. by S. $\frac{1}{4}$ S., southerly, for Hammond Rock, keeping it a little on the port bow, which will take a vessel nearly in mid-channel, and clear Wednesday Spit. Pass Hammond Rock at a distance of 2 or 3 cables, then haul up S.W. by W. going between **c** or Ipili, and **d** or Sunk Reefs, which are the only dangers in the channel, and may be avoided by keeping the North extreme of the higher Double Island well on with the North point of Hammond Island, until the West end of Goode Island bears South. Should Double Island not be visible, steer the same course as before directed (S.W. by W.) after passing Hammond Rock, bordering upon **c** reef—which is always dry—and giving **d**, the more dangerous reef, a wider berth. When the West end of Goode Island bears S.E., steer W. $\frac{3}{4}$ S., which course will lead about $1\frac{1}{2}$ mile to the northward of Larpent Bank and Booby Island. Caution should be used to avoid *Channel Shoal*, lying 1 mile N.W. by W. from the West end of Goode Island, and *Harrison Rock*, of $2\frac{1}{2}$ fathoms, $1\frac{2}{3}$ mile N.W. of the West end of Goode Island, marked by a black buoy on its South side.

Sunk Reefs, on the North side of the West end of Prince of Wales Channel, are reported by the signalman at Goode Island to extend $1\frac{1}{2}$ mile farther westward than shown on the Admiralty chart, or to long. 142° 6′ 15″ E.

Light.—On the summit of *Goode Island* (Palilug), about 250 ft. high, there

is a flagstaff and signal station, and a temporary *fixed bright* light, visible 7 miles, is shown from the signalman's cottage. The light is visible in Prince of Wales Channel, where not obscured by land, and also in Normanby Sound between S.E. by S. and S. by W.

Booby Island, the westernmost island, or land of any kind, in Torres Strait, lies W. by S. ¼ S. 14 miles from Goode Island, and in lat. 10° 36′ 5″ S., long. 141° 54′ 45″ E.; it is fringed by a narrow coral reef, except at its S.W. extreme, where it runs out about one-third of a mile, forming a spit, on which the brig *Freak* struck in 1848, by incautiously rounding it too closely. There is temporary anchorage in 7 fathoms, under the lee of the island. A shoal bank of 9 ft., on which the barque *Banda* grounded in 1874, lies half a mile N.E. of Booby Island.

Although Booby Island is a mere rock, yet, from the various associations connected with it—being during one-half of the year the constant resort of Europeans—it becomes at once a place of interest and utility, deserving particular notice. The island is about two-thirds of a mile in circumference, flat-topped, and between 30 and 40 ft. high, with a summit of bare rock.

As Booby Island is not inhabited, and its position is very favourable for the purpose, a supply of provisions and other necessaries, for the use of shipwrecked or other distressed people, has been deposited in a cave at the base of the cliff on the West side of the island; this supply is renewed from time to time, by vessels passing through Torres Strait from Sydney.

A chest or cask, with the words "Post-office" painted in large letters, was placed on Booby Island, for the reception of letters. It contained a book with writing materials, in which vessels' arrivals and other information might be registered.

Proudfoot Shoal Lightvessel.—In December, 1883, a lightvessel was placed about 1¼ mile S.W. of Proudfoot Shoal, lying about 36 miles westward of the western entrance of Prince of Wales Channel. An *occulting bright* light is shown, eclipsed for 4 seconds at intervals of 10 seconds, elevated 40 feet and visible 11 miles. Position, lat. 10° 32′ 10″ S., long. 141° 27′ 15″ E.

Normanby Sound is the channel leading from the West end of Prince of Wales Channel to the settlement on Thursday Island. It passes between Friday Island on the South, and Goode and Hammond Islands on the North, the prominent dangers being marked by buoys and beacons. Vessels not drawing over 22 ft. will find safe and commodious anchorage here at all seasons, that most frequented being in Ellis Channel. In entering, Vivien Point flagstaff, in line with the North side of Black Rock, E. ½ S., leads southward of the 3-fathoms shoal extending 6 cables W.S.W. of Goode Island. The tides are very irregular and the tidal streams strong.

The settlement at *Thursday Island* (Wai-ben) is on Vivien Point, the S.W. extreme of the island, and consists of some half dozen detached buildings, including the Magistrate's house, &c. The mail steamers between Queensland

and Singapore make it a port of call, which is of great advantage to those engaged in the pearl fishery, now of increasing importance on Osman Reef, and near Jardine River. A coal hulk is moored South of the settlement; no fresh supplies were procurable, and fresh water is scarce. It is in telegraphic communication with Brisbane.

Ellis Channel, the direct channel from Thursday Island to Cape York, not being adapted for vessels drawing more than 16 feet, the mail steam vessels will have to enter and depart by Normanby Sound.

Bramble Channel is bounded to the southward by Hawkesbury and Stonehenge Reefs; and to the northward by Long Reef, Spencer Isle, and the shoal extending to the westward from it. It is about 14 miles long, and one-third of a mile broad at its narrowest part. Its western entrance appears tolerably clear of dangers, but as the channel itself has not been closely sounded, many hidden patches may still remain undiscovered; and as the tide streams run 5 and 6 knots—the flood to the westward, and the ebb to the eastward—Bramble Channel is not to be recommended, except in cases of necessity.

BANKS CHANNEL, which runs between Long Reef and Banks and Mulgrave Islands, is about 15 miles long, and 1½ mile broad at its eastern entrance. The eastern, and greater portion of the channel is broad, well defined, and clear of dangers, but numerous islets, rocks, and shoals render the western entrance intricate and dangerous. There is good anchorage in nearly all parts of the channel.

DIRECTIONS.—A vessel intending to enter Banks Channel from the eastward, should steer for the South point of Banks Island, and round the East extreme of Long Reef, on which the sea breaks, at a distance of about half a mile, when the water will immediately be smooth. Having entered the channel, follow the trend of Long Reef, keeping as nearly as possible in mid-channel until the highest peak on Banks Island is in line with the S.E. hill of Browne Isle, the latter half a mile distant; then steer for Messum Rock, until the South extreme of Green Islet is in line with Cocoa-nut Point, the S.W. extreme of Mulgrave Island, and at the same time the centres of Clarke and High Isles are in line with Banks Peak, the north-easternmost peak on Banks Island. Round the coral patches which skirt N.W. Reef, and stand toward Quoin Rock, keeping it open on the port bow, until the south-eastern, or H. Wilson Isle, is in line with Whale Isle; then a West course will take the vessel clear of Banks Channel, passing at about half a mile to the northward of Quoin Rock.

Bligh Channel, the northernmost of all the known channels through Torres Strait, is bounded to the southward by the 2½-fathoms patch north-westward of Black Rock, Castle Reef, South Islet Rocks, Midway Rocks, Tree Islet, and North Bank. It is bounded to the northward by Jervis Reef, North Patch, North Isle, and the shoals extending to the eastward from Farewell Islets.

Vessels entering Bligh Channel from the eastward are recommended to pass between Possession Islet and Providence Shoal, keeping in mind that the tide runs with great strength, rendering the frequent ascertaining of the ship's position by cross bearings necessary. The channel between Providence Shoal is dangerous, a bank of 7 or 8 ft. having been discovered by H.M.S. *Basilisk* 3¼ miles E. by S. ½ S. from Passage Islet.

Bligh Channel is little more than half a mile wide between Castle Reef and North Patch, and the navigable part is barely 2 cables across, between Mid Reefs and the S.E. spit of Farewell Shoals. The depth varies from 5 to 8 fathoms, except abreast of Midway Rocks, where a 3¼-fathoms patch lies in mid-channel; and as the tide streams rush through with great velocity, Bligh Channel may be considered not only intricate but dangerous.

A vessel may anchor in from 6 to 9 fathoms, at half a mile to the north-westward of Castle Isle, and at about the same distance to the north-eastward of Tree Islet; but neither is recommended as anything better than a temporary anchorage, on account of the strong tide streams.

Remarks.—Of all the western channels through Torres Strait, Prince of Wales Channel is decidedly the best, the disadvantages of Endeavour Strait having already been explained. As in the several passages to the northward of Prince of Wales Channel, described in the foregoing directions, the tide streams are rapid and uncertain, and there are but few marks to lead clear of the numerous dangers with which these channels are studded, it is strongly recommended that no vessel attempt to pass through Bramble, Banks, or Bligh Channels, either from the eastward or westward, without first anchoring, and sending boats to point out the sunken dangers at the West entrances. Even with this precaution, a most vigilant look-out from the masthead will be indispensably necessary, and in no case should the attempt be made with the sun ahead. During the N.W. monsoon the water in the northern part of Torres Strait is frequently much discoloured.

CHAPTER XX.

THE CORAL SEA, AUSTRALIA, ETC.

In this the concluding chapter of the descriptions of the coasts and islands our remarks must be brief. The region it embraces is a very important one, and therefore requires, to elucidate it fully, a considerable amount of detail, which the bulk of this volume will not admit of. Moreover, as a great portion of Australian navigation is confined to its own localities, our remarks will not extend beyond pointing out those dangers which a ship passing to or from the Pacific to its principal ports or channels will encounter. All beyond this is left for a future work.

THE CORAL SEA.

The north-eastern coast of Australia, and the adjacent sea, are the most dangerous parts of the Pacific. From its character, Capt. Flinders proposed, in the second volume of his voyage, that it should be called the "Coral Sea," a most appropriate and expressive name, now generally recognized. Admiral Krusenstern was the first to use it, and in so doing expresses his admiration of the man whose indefatigable exertions and high scientific attainments have placed Australian hydrography in the eminent position it holds.

The Coral Sea is comprised between the N.E. coast of Australia on the West, and the New Caledonian range on the East. To the northward the coasts of the Louisiade Archipelago and that of New Guinea may be taken as its limit, and to the southward by the parallel of 25° S., as the detached reefs, which are its distinguishing feature, do not extend beyond that. As may readily be conceived from its title, the navigation is of a dangerous character without due caution, and this was especially the case before many of its numerous reefs were surveyed and properly delineated. This evil is, however, in some measure removed by the surveys of Capt. Denham, R.N., in 1854-60, which have given us the true character of many of the reefs, and also of a large portion of the redoubtable Barrier Reefs which front the Australian coast. These last will be presently described in a brief manner; and for the outlying shoals we commence with the southward.

Cato Islet and Bank were discovered by the ships *Porpoise* and *Cato*, August 15, 1803. The islet is a dry sand-bank, one-third of a mile long, with a little vegetation reaching to 19 ft. above high water, situated near the West end of a shallow lagoon reef. Innumerable birds flock around it. Its situation, according to Capt. Denham, is in lat. 23° 15′ S., long. 155° 34′ E. He erected a cone-shaped beacon, 12 ft. high, on it, and recommended it as a site for a lighthouse, as a guide into the Outer Route from the southward. A bank, with 10 to 30 fathoms, extends 5 miles from all sides but the South. *Hutchinson Rock*, of 18 ft., lies 3¾ miles E. by N. of the island. It is high water, on full and change, on Cato Bank, at 8ʰ; rise 6 feet.*

Wreck Reef, on which the *Porpoise* and *Cato* were lost, with Capt. Flinders on board, in the night of August 15, 1803, is the central part of a chain of reefs, extending 18½ miles E. by N. and W. by S. *Bird Islet*, on their East extreme, lies in lat. 22° 10′ 30″ S., long. 155° 29′ 21″ E., and is 12 ft. in elevation above high water. It has a little grass and some creeping plants on it. In 1868 two families were living here, preparing guano for shipment. There is anchorage in 10 to 16 fathoms, at one-third to half a mile W.N.W. from the West extreme of Bird Islet reef.

Wreck Reef has a sand-bank on it, one-third of a mile in circumference, and 4 ft. above high water, in lat. 22° 11′ 20″ S., long. 155° 19′ E. On its North and N.W. sides there is anchorage in from 18 to 25 fathoms, coral sand, at a distance of 1 to 2 cables from the reef. Near West Islet is a reef-sheltered haven, with 4 to 7 fathoms water in it.

This chain consists of many distinct reefs, of different sizes, the six principal of which are from 4 to 8 or 10 miles in circuit; these are separated by channels, from 1 to 3 miles wide; in the two easternmost, Capt. Flinders found from 8 to 10 fathoms water, and nothing to prevent a vessel pushing through in case of necessity. It is high water, on full and change, at Wreck Reef, at 8ʰ 3ᵐ; rise 6 feet.†

Kenn Reef, discovered by Capt. Kenn, in the *Martin Shand*, April 3, 1824, was afterwards too well known from the wrecks of the English ship *Rodney*

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* Among the doubtful announcements the following may be placed:—

Ferrier Reef, 18 miles S.E. by S. ½ S. from the East end of Cato Bank, was reported by Capt. King, of the *Waterwitch* whaler. Capt. Cheyne argues that it must have been the East extreme of Cato Bank.

Australia Reef, discovered by Capt. Slight, 1824. It cannot be seen far off, as the sea is very smooth around it sometimes. It is also said to exist by Capt. T. B. Simpson, of Sydney, but was not seen in the *Herald*, when 200 to 400 fathoms were found. Lat. 22° 45′, long. 156° 6′.

William IV. Island is placed on some charts in lat. 24° 18′ S., long. 154° 47′ E., but it appears improbable.

† *Carns* or *Mid-day Reef* is in lat. 21° 58′ S., long. 154° 20′ E., according to Mr. Carns, in his report of its discovery in the *Neptune* in 1818. A sounding of 220 fathoms, no bottom, having been found on the spot, it must be the same as either Saumarez or Wreck Reef.

and the Dutch barque *Olivier Van Noord*, January 7, 1858. It had been seen by the *Gambia*, in 1851, and by the *Jenny Lind*, Capt. Taylor, in 1851, who correctly placed it.

Kenn Reef consists of four separate reefs, which form a curved chain, extending N.E. by E. ½ E. 6½ miles from its S.W. extreme to its eastern projection, and from thence nearly N.W. by N. ½ N. 10 miles to its N.W. extreme; the western side thus forming a bay, on a bank of soundings in 5 to 37 fathoms, coral sand and rock, extending north-westward 8 miles from the bight, outside of which the depth suddenly increases to no bottom in 250 fathoms.

The south-easternmost and largest reef, which dries at half-tide, and on which the sea always breaks, is of a triangular shape, extending from its eastern projection—on which is a high reef stone—S.W. by W. 4 miles, and N.W. 2½ miles. The S.E. and N.E. sides of this reef are slightly embayed, and the former was found by Capt. Denham, in 1859, so strewed with wrecks, as would suggest a lighthouse being erected on the reef, if it were fit to sustain such a structure and party. The western side is broken and irregular, with a 5 to 7-fathoms inlet trending half a mile eastward, and three-quarters of a mile northward into the shallow lagoon enclosed by the reef.

There are three slightly vegetated sand cays on the south-easternmost Kenn Reef, nearly in line N.E. by E. and S.W. by W., and 1¼ mile apart. The central and largest of these cays, which does not exceed 150 yards in length, nor 6½ ft. above high water, lies in lat. 21° 15′ 44″ S., long. 155° 49′ 25″ E. Capt. Denham built a beacon on it from pieces of wreck found on it; and also sowed some garden seeds.

Frederick Reef, discovered in 1812, by the vessel whose name it bears, consists of two coral reefs and a rock awash, extending 6½ miles N. by E. ½ E. and S. by W. ½ W., the reef being awash on the South and East sides. Observatory Cay, on its South end, 5 ft. above high water, is in lat. 21° 1′ 46″ S., long. 154° 25′ 7″ E. It is high water, on full and change, at 8ʰ; springs rise 6 ft. The southern portion encloses Anchorage Sound.

Anchorage Sound is nearly 2½ miles wide between the North point of the southern Frederick Reef and Ridge Rock, and 2⅓ miles deep, with regular soundings in 10 to 17 fathoms, coral sand, affording excellent anchorage, sheltered from the sea eastward, between N.N.E. and S.S.W., without any sunken danger up to within half a mile of the bight, near Observatory Cay.

Saumarez Reef was discovered by Capt. Lihou, in the *Zenobia*, February, 1823. The survey shows it to be an extensive bank or reef, separated from the projection of the Great Barrier Reef of Australia (Swain Reef) by a channel 35 miles broad. Sir James Saumarez Reef is 23 miles long, N.E. and S.W., and from three-quarters to a quarter of a mile broad. The N.E. cay (8 ft. high) is in lat. 21° 38′ 11″ S., long. 153° 47′ 21″ E. It is the *Welsh Bank* of Capt. King's chart.

David Reef (?), reported to be in lat. 19° 20′, long. 151° 0′, is probably the

same as Marion Reef, hereafter described. There is no bottom at 230 fathoms on the spot.

Horse-shoe Shoal (?).—A discovery of Lieut. Vine. Its northern extreme is in lat. 20° 5′ S., long. 151° 50′. The convex side is to the southward extending 15 miles to the South and East. It is perhaps a part of the Great Barrier Reef, more to the westward, as Capt. Denham found a depth of 200 to 250 fathoms, sand, on the position.

Kelso Bank.—Capt. Black, of the *Kelso*, on April 20, 1865, when in lat. 24° 12′ S., long. 159° 27′ E., was on the North end of some discoloured water, on which he got several casts of the lead, finding bottom at from 25 to 13 fathoms, fine coral sand, with red specks, small shells, and seaweed. They sailed over it for two hours in a N.N.W. direction, the bottom being distinctly seen the greater part of the time, with large stones covered with seaweed. H.M.S. *Dart*, 1883, found a depth of 11 fathoms on it in lat. 24° 16′ S., long. 159° 27′ E. A shoal of 11 fathoms, probably part of Kelso Bank, is reported to lie in lat. 24° 6′ S., long. 159° 45′ E.

Capel Bank.—In 1835, H.M.S. *Hyacinth* obtained several soundings of from 32 to 40 fathoms, in lat. 25° 18′ S., long. 159° 20′ E. These banks were thought to be disproved by a deep sounding of 1,025 fathoms without finding bottom, tried for by Capt. Denham, at 8 miles westward of Kelso Bank. But it is probable that it does exist, and there may be others in this neighourhood.

BELLONA, Booby, Chesterfield, and Bampton Reefs.—A long line of reefs extending over nearly three degrees of latitude, between 19° and 21° 55′ S., between longs. 158° 10′ and 159° 35′, have been frequently noticed. The northern part is Bampton Reef and Chesterfield Reef, the centre is Booby, Minerva, and Ball Reefs, and the southern is Claudine and Bellona Reefs.* They have been but incompletely examined, especially on their eastern face.

South Bellona Reefs are two in number, awash at half tide, with a detached sand cay at 1⅔ mile N. by W. from the North extreme of the eastern reef. The West point of the western reef lies in lat. 21° 52′ 22″ S., long. 159° 26′ 10″ E., from whence it extends E. ½ N. 4½ miles, and is 1 mile to half a mile broad. The eastern reef of the South Bellona group, which is separated from the western reef by a 7-fathoms channel half a mile wide, is 5 miles long N.E. and S.W., and 1 to 1½ mile broad. It encloses a lagoon, which appears to have no entrance through the reef. The northern extreme of this reef is rendered con-

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* The *Bellona Reefs* were discovered by the ship *Bellona* in 1793. *Claudine Reef* was seen by Mr. Welsh in 1820. Western breaker of Middle Bellona Reef was brobably seen by Lieut. Lamb in the *Baring* in 1812, but placed one degree farther East. *Booby Reef* was seen by Lieut. Ball in the *Supply* in 1790. *Minerva Shoal*, a portion of the N.W. Bellona Reef, was seen by a vessel of that name in 1818. *Bampton Reef* and *Chesterfield Reefs* were discovered by the ships *Hormuzeer* and *Chesterfield*, in June, 1793.

spicuous by Nigger Head Rock, a black and unusually large block of coral 6 ft. square, and 2 ft. above high water. *Sand Cay*, N. by W. ¼ W. 1¾ mile from Nigger Head Rock, and in lat. 21° 47′ 20″ S., long. 159° 35′ 1″ E., always shows brightly, and, being 5 ft. above high-water level, it may afford temporary refuge to the crew of a vessel wrecked on the adjacent reefs, where there is no footing at high water.

Middle Bellona Reefs are two in number, lying nearly E. ½ S. and W. ½ N. from each other, with a navigable opening between them. The western reef, which uncovers at half tide, and encloses a small lagoon, is 1½ mile long N.E. and S.W., and 1 mile broad at the centre. *Observatory Cay*, which is situated on the northern of the two reef points at the West extreme of the reef, and in lat. 21° 24′ 18″ S., long. 158° 52′ 51″ E., is a bright coral sand-bank, half a mile long East and West, and 7 ft. above high water. It is the resort of great numbers of birds and some turtle, and numerous whales were seen near it. Capt. Denham erected on the centre of the cay a barrel-post beacon, in 1858.

Western Breaker, W. by S. ½ S. 5½ miles from Observatory Cay, is a square cluster of rocks just below the surface, and about half a mile in extent. The sea breaks upon it, but at long intervals.

It is the more dangerous from its lying so far from the main reefs, and in the direction of passing vessels; it should therefore be approached with due caution.

The eastern Middle Bellona Reef lies 6 miles E. ½ S. from Observatory Cay; it is 4 miles long E. by N. and W. by S., enclosing a lagoon.

Booby Reef, the N.W. extreme of which lies in lat. 20° 57′ S., long. 158° 31′ 53″ E., is 7 miles long N.W. by W. ½ W. and S.E. by E. ½ E., and about 1 mile broad, with some sunken patches close off its S.E. end. With the exception of some black coral rocks, which always show 4 to 6 ft. out of the water, on the southern part, it always becomes awash at half tide.

N.W. Bellona Reef, the S.E. end of which lies N. by W. 6 miles from the N.W. point of Booby Reef, is 5 miles long N.W. by N. and S.E. by S., and about 1 mile broad, its N.W. point lying in lat. 20° 47′ 36″ S., long. 158° 28′ 8″ E. This, like Booby Reef, has no soundings along its western side. It is awash at half tide, and showed some conspicuous blocks of darkened coral on it.

The space eastward of Bellona and Chesterfield Reefs has not been examined. *Bellona Shoal* is *reported* to lie in lat. 20° 55′, long. 159° 47′. *Minerva Shoal*, in lat. 20° 50′, long. 159° 22′, was sounded on in 8 fathoms, but shoaler water was seen to the S.W. A rocky patch of 5 fathoms was reported in 1877, in lat. 20° 20′, long. 159°.

Miller Reef.—The barque *Henry Miller*, in December, 1868, struck on a reef to the westward of Bampton and Bellona Reefs, in lat. 20° 51′ S., long. 158° 2′ E.; it was about 2 miles long N.W. and S.E., and 1 cable wide. Neap tides rose 18 inches. The position is open to some doubt.

Chesterfield Reefs and Islets are three long narrow barriers, extending

from their South elbow, in lat. 19° 59′ S., long. 158° 30′ E., north-westward 27 miles, to their N.W. point, in lat. 19° 37′ 23″ S., long. 158° 13′ 20″ E. The south-easternmost of these reefs forms a loop, with its bight to the S.E., where the South part of the elbow is well marked by *Loop Islet*, a small flat-tufted island, 12 ft. above high water, situated just within the reef, at two-thirds of a mile northward of the outer edge of the elbow. *Anchorage Islets*, which owe their name to the very smooth and secure anchorage to the westward of them, are a group of small islets on the eastern barrier. The third islet from the North is 38 ft. above high water, and bears N. by W. ¼ W. 5 miles from Loop Islet These islets and the dry sand-ridges on the reef add to its elevation, so as to render it a natural breakwater from the eastward.

Chesterfield Isles are thirteen in number, of which Loop and Anchorage Islets, on the eastern barrier, have already been noticed. The remaining five isles of the group are Passage and Long Isles, and three smaller islets between them; the latter being situated on the same reef with Long Island, from the S.E. extreme of which they are distant respectively 1, 1¼, and 2¾ miles.

Avon Islets, the southern of which lies in lat. 19° 32′ 5″ S., long. 158° 15′ 27″ E., are each about 170 yards in diameter, and, including the bushes on them, 17 ft. high. Each islet is fringed by a reef, but not of sufficient spread to afford sheltered anchorage near it.

Bampton Reef is the western edge of a bank of soundings extending to the bank of Chesterfield Reefs, the eastern limits of which have only been partially surveyed. This reef forms a narrow barrier, trending from its South point, northward of Avon Islets, N. by E., 22 miles, when, after a turn of 3 miles to the eastward, it extends N. by W. 7 miles to its N.W. elbow, in lat. 19° 1′ 19″ S., long. 158° 27′ 3″ E.

This Bampton Barrier is a low double-edged reef, with here and there a cluster of reef-stones and an occasional solitary rock, standing up 6 ft., which, when first seen on the horizon, have, from their leaning attitudes, the appearance of lug-sail boats.

The following is from the report of Lieut. Richards, H.M.S. *Renard*, 1878:—

Bampton Islet, about 10 miles S.E. of the N.W. elbow of Bampton Reef, is 17 ft high, with some bushes on it. A sand cay lies 2 miles West of it. At 3 miles N.E. of Bampton Islet *North Bampton Reef* commences, extending thence 4¾ miles N.E., and then S.E. and East 5¼ miles, terminating in a sand cay, eastward of which is a deep passage 2 miles wide. On the East side of this passage another reef extends in broken patches 8 miles to the northward, to the extreme North point of Bampton Reef, in lat. 18° 56′ 30″ S., long. 158° 52′ E.

The eastern side extends 9½ miles S.E., where it forms a small horse-shoe reef, at 1 mile S.E. of which is the East extreme of the *N.E. Bampton Reef*, trending first 2¾ miles to a sand cay, and then 2¾ miles S.W. *Renard Island*, 4¾ miles from the South end of the N.E. Reef, is 20 ft. high, including the

bushes. Anchorage may be obtained on the N.W. or West sides. It is high water at Renard Island, on full and change, at $8^h\ 20^m$; springs rise about 5 ft.

At 3½ miles S.E. by S. from Renard Island *S.E. Bampton Reef* commences, extending 10 miles to the southward, with a sand cay S.W. of it. At 5 miles S.W. of this cay are some detached reefs; it seems probable that these continue to lat. 19° 50′ S., the parallel in which breakers were seen from the whaler *Velocity*, in 1876.

Brown Reef.—Capt. J. L. B. Brown, on October 12th, 1867, saw a *break* in lat. 17° 38′ S., long. 154° 43′ E. Although he was not perfectly sure that there was a shoal, yet it had every appearance of one, and therefore should be guarded against.*

Marion Reef, discovered by Mr. Paget, of the schooner *Marion Renny*, in 1868, is reputed as 30 miles long in a N.E. and S.W. direction, its South extremity lying in lat. 19° 10′ S., long. 152° 14′ E. There are three sand-banks on it, and two detached patches lying 2 or 3 miles off its N.E. end.

The northern of the *Wansfell Reefs*, reported by Capt. Brodie, of the ship *Wansfell*, 1864, may be the same as Marion Reef. He reported it as 5 or 6 miles in circumference, and of coral, in lat. 19° 20′ S., long. 152° E. The other, 10 miles in circumference, and open to the N.N.E., was stated to lie in lat. 20° 5′ S., long. 151° 5′ E.

Mellish Reef and Cay were discovered by Capt. A. Bristow, in the *Thames*, April 5th, 1812. He describes the cay as a low sandy islet, 8 ft. above the water, composed of broken coral and shells, about half a mile long. A similar bank lies 5 miles to the northward.

This is the reef on which the French war steam vessel *Duroc* was wrecked, in August, 1856. An open beacon was erected on it from the wreck, by Capt. Denham, in 1859, 40 ft. high; this was reported, in 1879, to have disappeared. His examination places it in lat. 17° 24′ 39″ S., long. 155° 53′ 25″ E. It is about 5½ miles long N. by W. and S. by E., with deep water close round it. No bottom with 200 and 250 fathoms for many miles around.†

Lihou Reef and Cays.—An extensive range of coral reefs appears on the charts under this name, though it is not that of the first discoverer. There are several who have seen different portions, but the survey has shown that they form portions of a continuous bank.

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* *John Wesley Island(?)*—An announcement was made in the Shipping Gazette, February, 1858, of an island seen by a vessel of the above name, in lat. 19° 16′ S., long. 155° E., of recent volcanic origin, on fire all over; shoal water to the S.S.W. We have the greatest doubts as to this, but must insert it. A sounding of 230 fathoms and no bottom has been taken in the locality.

† *Young's Reef*, in the same latitude, but said to be in long. 155° 20′, is probably the same.

The first, the *Alert Reef*, discovered by Capt. Brodie, in the brig *Alert*, in 1817, is the N.E. part of the reef. *Vine Bank*, seen by Lieut. Vine, is the south-western part. *Farquhar Group*, discovered in 1821 by M. Tregrosse, in the French ship *Les Trois Frères*, in company with the English brig *Jessie*, is also on the S.W. part. *Lihou Shoal*, a name now applied to the whole, was discovered by Capt. John Lihou, in the *Zenobia*, in 1823, and is probably the centre of the range. Capt. Toynbee, in the *Gloriana*, also saw a portion of the centre of the S.E. side in 1855. All these, however, are now clearly shown by the survey to form part of a range which extends in a N.E. ½ E. and S.W. ½ W. direction for 56 miles, but of unknown breadth (for its N.W. side has not been examined—a circumstance much to be regretted). Several low sandy cays lie on this outer reef; that at the S.W. extreme is in lat. 17° 38′ S., long. 151° 26′ E., and *Observatory Cay*, at the N.E. end, 6 ft. above high water, is in lat. 17° 7′ 15″ S., long. 152° 6′ 20″ E. On its S.W. side, on the meridian of 152° E., is an entrance named the *Herald Passage*, but which is probably the Lihou Shoals of 1823.

Tregrosse Islets are two small islets, 4 miles apart North and South, discovered by Captain Tregrosse in 1821, to the West of the Lihou group, the southernmost in lat. 17° 43′, long. 150° 43′. Two reefs are represented to lie about 6 and 13 miles W.S.W. of the southern islet. M. Tregrosse steered through a passage 5 or 6 miles wide, which appeared safe, but as they have not been surveyed, they require much caution.

Herald Cays are two small islets, 4 miles apart N.E. ¼ E. and S.W. ¼ W., the northern 23 ft. high, in lat. 16° 55′ 52″, long. 149° 12′ 56″ E.

Herald's Surprise, a small dangerous isolated reef, discovered unexpectedly by the *Herald*, which was nearly being lost on it, lies in lat. 17° 21′ 18″ S., long. 148° 28′ 50″ E.

Flinders Reefs lie to the South of this, nearly on the same meridian, and extend southward 20 miles to lat. 17° 53′ 30″ S., long. 148° 27′ 50″ E. The N.E. elbow lies in lat. 17° 39′ 50″ S., long. 148° 34′ E.

Malay Reef, 45 miles eastward of Flinders Reef, was discovered by Captain Love, of the American barque *Malay*, in 1875. It is a mile in circumference, and its position, lat. 17° 58′ S., long. 149° 20′ E., is considered correct, as a departure was taken from Herald Cay the previous day.

Holmes Reefs.—The S.W. extreme lies in lat. 16° 30′ S., long. 147° 47′ 41″ E., from whence they extend 13 miles eastward, and 7 miles northward. They were discovered in 1854, and were again seen by M. Magdelaine in 1856.

Coringa Islets are two sandy cays, on which the *Coringa* packet was wrecked in 1845. A portion of the crew were left on, and the schooner *Frolic* was sent to bring them off; her observations place the East islet in lat. 16° 53′ S., long. 149° 55′ E., which was verified by Mr. Dobson, in the *Ariel*, in 1849.

They are evidently the two islets seen August 4th, 1853, by Capt. George Pearson, in the *Cashmere*. They were from 18 to 20 ft. high, covered with

bushes, and apparently with a fine sandy beach, visible from the deck 9 or 10 miles off. He made the West side of the East island in lat. 16° 53′ S., long. 149° 51′ E., the West island being 8 miles W. by S. The name *Willis Islands* was given from the owners of the ship.

Madelaine Cays, discovered in 1856 by an officer of the *Duroc*, on his passage with two open boats from the wreck of that vessel, near Mellish Reef, to Timor. They were partially surveyed by Capt. Denham in 1860. The southernmost, which is 23 ft. high, is in lat. 16° 35′ 47″ S., long. 150° 19′ 46″ E. The northern one, a sand cay, lies 6 miles N.W. by N. ½ N. of the former.

Willis Islets, of the Admiralty chart, though apparently not the discovery of Capt. Pearson, related above, consist of a reef 13½ miles long, North and South, on the eastern side of which is a line of islets and reefs awash. The South islet, 33 ft. high, is in lat. 16° 16′ 48″ S., long. 150° 1′ E. At its N.E. point is another small cay, and one also midway between. It is high water, on full and change, at 8^{h}; springs rise 6 ft.

Osprey Reef, discovered in 1844, is the north-westernmost danger bordering the Outer Route to Raine Island, on the western side. It is a lagoon reef, forming nearly an equilateral triangle, with sides 5 miles long; its East angle, or weather elbow, the most projecting part of the reef towards the Outer Route, being in lat. 13° 51′ 10″ S., long. 146° 36′ E., the two western angles lying N. ½ W. and S. ½ E. from each other. The three sides of the reef are smooth on the surface, and barely show at half tide.*

Diana Bank, in lat. 15° 41′ S., long. 150° 30′ E., was discovered by M. Bougainville, in 1768; although it is doubtfully placed on the chart, with regard to longitude, M. Bougainville's position has been corrected by the critical authority of Capt. Flinders; and the bank cannot lie far to the eastward of where it is placed, as the numerous tracks on the chart will prove. It is now placed on the chart in 15° 46′ S., long. 151° 28′ E.

The *Two Shoals of Bougainville* were first seen by that navigator, June 6, 1768. The first is in lat. 15° 17′, long. 147° 57′; the second in lat. 15° 35′, long. 148° 6′. They are uncertain as to existence and position. Captain Denham, R.N., searched for these reported dangers during six days over 300 square miles around the reported position, between the parallels of 16° 20′ and 14° 20′ S., and the meridians of 147° 10′ and 149° 50′ E., without finding bottom with 230 fathoms of line out. He expresses the opinion that Bougainville's reckoning might have been out one degree in latitude, and that he saw the Holmes Reefs, described on page 962.

Eastern Fields, discovered by Captain Flinders, in the colonial schooner *Cumberland*, are a group of detached reefs, with their N.E. extreme in lat.

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* *Drayon Bank*, of 17 fathoms, in lat. 11° 50′ S., long. 145° 50′ E., is of doubtful existence or position, as Capt. Denham found no bottom with 240 fathoms on the spot.

10° 2′ S., long. 145° 45′ E. Their extent to the southward and westward is uncertain; but as laid down on the chart by Capt. Flinders, they extend at least 20 miles to the westward, from the N.E. extreme. The *Cumberland* passed through the reefs; but as little or nothing is to be gained by such a route it is not to be recommended, more especially as their N.E. extreme is so accurately laid down as to afford a fair point of departure for making the Pandora, or Bligh Entrance, by a vessel proceeding westward through Torres Strait.

Boot and Portlock Reefs.—These reefs, together with others, extending to the southward, form a chain of imperfectly known reefs, lying about midway between the Eastern Fields and the Great Barrier Reefs, and nearly parallel with the latter.

The Outer Route from Sydney to Torres Strait has been before alluded to in comparison with the Inner Route inside the Barrier Reefs. It is presumed the navigator will now scarcely hesitate in choosing the Outer Route, since Capt. Denham, in his survey of the Coral Sea, determined the positions and extent of all the reefs which border the route, and cleared the chart of many supposed rocks and shoals, which caused nearly as much perplexity as real dangers; and it is only necessary to repeat that the proper season to make the passage from Sydney to Torres Strait, by the Outer, as well as the Inner Route, is considered to commence on the 1st of April, and to end with the month of September.

Vessels after leaving Sydney, or any of the southern colonies, for Torres Strait, are recommended to make the most direct course to approach the southern entrance of the Outer Route on the parallel of 24° S., and the meridian of 157° E. It being presumed that the vessel is navigated by chronometers, with well-known errors and rates, there would be no object in sighting either Cato Islet, Bird Islet on Wreck Reef, or Observatory Cay on Kenn Reef.

Having crossed the parallel of 24° S. in long. 157° E., steer N. by W. ¼ W., 170 miles, when the vessel will have passed 70 miles eastward of Cato Bank and Wreck Reef, and will be in lat. 21° 10′ S., long. 156° 45′ E., or 50 miles eastward of Kenn Reef. The next course will be nearly N.W. ¼ W. 430 miles, to lat. 15° 30′ S., long. 152° E., passing 50 miles eastward of Lihou Reef.

If intending to enter the Great Barrier Reefs by Raine Island, from lat. 15° 30′ S., long. 152° E., the direct course will be W. by N. ¾ N. 510 miles to the island, passing 50 miles north-eastward of Osprey Reef.

A vessel by the Outer Route intending to pass through Torres Strait by the Great North-East Channel, having arrived at a position in about lat. 15° 30′ S., long. 152° E., should steer nearly N.W. ½ W., westerly, 550 miles to lat. 9° 5′ S., long. 145° 20′ E. This course will lead about 28 miles south-westward of Coutance Reef, 24 miles north-eastward of the Eastern Fields, and 35 miles north-eastward of Portlock Reefs. The vessel should carry no more sail at

night than she will conveniently bear if suddenly hauled to the wind; and every precaution should be taken against unknown dangers, which in this comparatively little-known region may still possibly exist.

From lat. 9° 5′ S., long. 145° 20′ E., steer W. ½ S. for Bligh Entrance, and proceed as directed at page 947.

The passage from Torres Strait to Sydney by the Outer Route appears not to have been often made, and like that from Torres Strait to Sydney by the Inner Route, was, before Capt. Denham's survey of the Coral Sea, considered only practicable in the N.W. monsoon—from November to February or March.

The first object after clearing Torres Strait, in the N.W. monsoon, will be to take advantage of westerly winds for making easting, looking upon immediate progress to the southward as of secondary importance.

In starting to the eastward from Prince of Wales Channel or Cape York in the N.W. monsoon, a vessel may proceed by Raine Island Entrance, or by the Great North-East Channel. Having cleared the Great Barrier Reefs or Eastern Fields, as the case may be, take every advantage of westerly breezes, and endeavour to reach a position in about lat. 15° S., long. 156° E., going as much as practicable over the frequented route shown on the chart, and keeping an especial look-out when proceeding eastward of the route, into the unexplored space northward of Mellish Reef.

Having attained the meridian of 156°, the vessel will probably be far enough to the eastward to take advantage of the S.E. trade, and by hauling on a wind on the port tack might fetch Mellish Reef, from whence the vessel may easily take a fresh departure for Sandy Cape, passing, if the wind permit, between Kenn and Wreck Reefs on the East side, and Frederick and Sir James Saumarez Reefs on the West side.

Should there be too much southing in the prevailing S.E. trade wind to weather Frederick Reef, the vessel may pass to the westward of it, and between Saumarez and Swain Reefs; when a southerly current will probably enable her to weather Sandy Cape, care being taken to avoid Break-sea Spit, and the shoal near its eastern edge.

As a rule a vessel should be so sailed as to close the intermediate passage reefs in the day time, to take a fresh departure, as the current between Saumarez and Swain Reefs may otherwise seriously affect the vessel's reckoning.

To the westward of New Caledonia there appears to be a series of detached shoals, which run in a direction somewhat parallel to that of the mountain ridges which compose that large island and its reefs. Perhaps there may be some geological connection between this parallelism, and more dangers may be found in the same line.

The dangers hitherto announced are as follow :—

Grimes Shoal, placed on the chart, 1825, without a name, in lat. 23° 53′ S., long. 161° 10′ E., is made by Capt. Grimes, of the *Woodlark*, to be 25 miles West of this, so that its longitude may be about 161° 0′ E. He describes it as having 70 fathoms least water on it.

Hamond Island, announced *from report*, by Com. (Sir A. S.) Hamond, R.N., is said to be in lat. 22° 30′ S., long. 162° 51′ E., but no bottom at 600 fathoms was found in this position.

A *Rock*, doubtful, in lat. 24° S., long. 160° 15′.

Tamar Reef.—A dangerous shoal, on which the *Tamar*, of Sydney, struck, in lat. 21° 21′ S., long. 161° 36′ E. It was reported to extend a long distance to the N.W., but it was sought for ineffectually by the *Herald*, when no bottom was found at 200 fathoms.

Fairway Reef, thus named from its lying nearly midway between the Bellona Shoals and New Caledonia, is of coral, about 1¼ mile in circumference, and awash at half tide, the rise being 3 ft. Lat. 21° 0′ 15″ S., long 161° 45′ 9″ E. It was on the charts in 1791, but was re-discovered by Capt. Denham, 1855.

Darling Reef.—In 1879 shoal ground of about 4 to 5 fathoms was reported by Capt. Williams, of the *Lady Darling*, in lat. 20° 22′ S., long. 162° 20′ E., but it was not seen by H.M.S. *Lark*, when near this position in 1882.

Nereus Shoal, in about lat. 20° 5′ S., long. 160° 30′ E., as reported to Capt. Simpson, is said to have 2 fathoms water on it, and was seen in 1829, and again in 1845.

Sandy Islets.—In 1876 the master of the whaler *Velocity* reported a line of sandy islets as extending along the meridian of 159° 57′ E., between lat. 19° 7′ and 19° 20′ S.

New Shoal, as it is called by the whalers, is very imperfectly laid down on the chart, as different authorities vary greatly as to its position ; it is said to be in lat. 20° 55′ S., long. 160° 28′ E. It is covered, but the sea breaks very heavily on it.

Middleton Reef, covered at high water, is about 5 miles long N.E. by E. and S.W. by W. Its West elbow is in lat. 29° 27′ 40″ S., long. 159° 4′ 17″ E.

ELIZABETH REEF (*Seringapatam Reef*, *Eliza Reef*).—This reef was discovered by the ships *Claudine* and *Marquis of Hastings* in 1820. When within 2 cables' lengths of it they had 14 fathoms water, hard rocky ground ; at a quarter of a mile off, the depth was 25 fathoms. The bank of soundings to 100 fathoms, on coral grit, extends from half a mile to over 1 mile off, the latter to the N.W.

This dangerous coral reef, which has proved fatal to many vessels, lies 300 miles from the coast of Australia. It is oval shaped, nearly 5 miles long East

and West, and 3 miles broad, enclosing a lagoon; its edges, with the exception of a few rocks, are covered at high water. Its centre is in lat. 29° 56′ S., long. 159° 4½′ E. It was surveyed in 1878 by Lieut. Richards, H.M.S. *Renard*.

There is anchorage in 10 to 17 fathoms, half a mile off the sand-bank on the N.W. side of the reef. The entrance to the lagoon is in the N.E. part of the reef; it is a cable wide at its narrowest part, with 10 fathoms in it, and is open on a S.W. ½ S. bearing. The lagoon is shallow and studded with coral patches.

A Life-Boat is moored in the lagoon for the purpose of succouring those wrecked on the reef; it is provided with necessary articles for making a voyage to the Australian continent, including provisions, medical stores, chart, compass, &c. Six casks of fresh water (each containing 15 gallons) are fitted as ballast as well as for use. It is requested that the following instructions be observed, viz.:—

That shipwrecked mariners will write a detailed account of their disaster, with the names of the survivors and those lost, also the place they intend to make for; this document is to be deposited in the nun buoy, and left floating at the moorings. With easterly winds it is better to cross the reef at the N.W. part. Navigators visiting the boat are requested to leave a report of their visit, with such intelligence as they may wish to communicate. If bound direct to an adjacent port, they are requested to forward any reports that may be found in the nun buoy. There is fair anchorage in 10 to 17 fathoms, on the N.W. side of the reef, at about half a mile off the sand-bank.

It is high water, on full and change, at Elizabeth Reef, at $8^h\ 30^m$; springs rise 8 ft., neaps, 5 ft.*

The *currents* in the neighbourhood of Elizabeth Reef are exceedingly variable, both in strength and direction, as it lies near the line of separation of two currents, one setting eastward and the other westward. It is probable that from May to September the current near it sets eastward, and from November to March westward.

LORD HOWE ISLAND was discovered February 17th, 1788, by Lieut. Ball, commanding the *Supply*. It is mountainous, and of volcanic origin, but well wooded, and much of the low land is fertile. *Mount Gower*, the highest part of the island, rises abruptly from its southern end, to an elevation of 2,840 feet, in lat. 31° 36′ 30″ S., long. 159° 5′ 10″ E. The island, which forms an irregular curve, slightly bending to the eastward, is about 5½ miles long,

* The following reported dangers may be considered not to exist:—*Favourite Shoal*, in lat. 26° 6′, long. 160° 0′. *Lady Nelson Shoal*, in lat. 30° 18′ S., long. 161° 6′ E. *Foster Tyans Shoal*, in lat. 31° 56′ S., long. 160° 0′ E., or about 30 miles E.S.E. of Ball's Pyramid; a *shoal*, in 31° 19′ S., 160° 42′ *W.*; and *Middleton Island* (or Sir Charles Middleton's Island), said to be very high, in lat. 27° 58′, long. 159° 30′.

N.N.W. and S.S.E., and from one-third of a mile to 1½ mile broad. The eastern side consists of several bays; and the greater portion of the West side is fronted by coral reefs, between which and the shore are shallow lagoons, with not more than sufficient depth of water for boats, or other small craft drawing about 5 feet water.

Off the North end of Lord Howe Island are the *Admiralty Islets*, a small group, distant about 1½ mile. Nearer the shore are several other islets.

Lord Howe Island is surrounded by a bank of soundings, extending from 3 to 5 miles, off the West side, and from 7 to 10 miles from the other parts of the island.

Although there appears to be a moderate depth of water at a convenient distance from the island, the anchorage cannot be considered good, in consequence of foul ground, and of sudden and violent shifting gales. Sailing vessels should anchor in such a position as to clear the land on either tack, should the wind set in. Ships approaching the S.E. part of the island within 1½ mile, will run a risk of being dismasted by the sudden gusts, should the wind be off shore. Captain Denham's observation spot at Middle Beach, North East Bay, is in lat. 31° 31′ 38″ S., long. 159° 5′ 58″ E.

The high land of the N.W. and that of the S.E. part of this island is joined by a low neck of land, on the S.W. side of which the settlement is founded, but the habitations are not visible from the sea. The inhabitants, in 1854, numbered between 30 and 40 persons; in 1859, there were 300 settlers, but this number is again reduced to 65 in 1880. They are Europeans or Americans who have been connected with whaling, and gained a living by bartering with whalers, but of late years the island has been almost deserted, and the inhabitants have at times been reduced to great straits. Pigs, goats, poultry, and vegetables are procurable, and fish may be caught in abundance round the island. The island belongs to New South Wales.*

The island being covered with wood, a plentiful supply of fuel as well as trees fit for timber may be obtained. Water is most plentiful at the South end, and may be obtained all through the year, at other parts of the island. In Boat Harbour, on the eastern side of the island, good water bubbles through the shingle, filtered from the impurities taken up in its course down from the hills.

It is high water, on full and change, at Lord Howe Island, at $8^h\ 30^m$; the average rise is about 6 feet.

BALL'S PYRAMID, in lat. 31° 45′ 10″ S., long. 159° 16′ 10″ E., or S.E. by E. 12½ miles from Lord Howe Island, is a remarkable peak, rising abruptly

* An interesting Report on this island, illustrated by numerous photographs, was published by the Government of New South Wales, at Sydney, 1882. See also "A Visit to Lord Howe Island," by Mr. Corrie, Surgeon, R.N., in the "Proceedings of the Royal Geographical Society," vol. xxii., 1878, pp. 136-143.

to the height of 1,816 ft. from a rocky islet. *Wheat-sheaf* and *Observation Rocks* lie about half a mile to the westward of Ball's Pyramid; the former is 191 ft., and the latter, to the northward of the Wheat-sheaf, is 70 feet in height. Close to the eastward of each is a lower rock; and at 2¼ miles S.E. ½ E. of the Pyramid is *S.E. Rock*, 26 feet high.

Ball's Pyramid and the rocks near it are, like Lord Howe Island, surrounded by a bank of soundings, extending from 2 to 5½ miles to the westward, and from 5 to 7 miles in other directions from the Pyramid.

AUSTRALIA, ETC.

The Coast of Australia, to the northward of Sandy Cape, in lat. 24° 41′ S., is fronted with the innumerable reefs previously alluded to, within which is the *Inner Channel* to Torres Strait, but which, as it is very intricate, and would require a very long description, will not be described here. It is also becoming of less importance now that the Outer Route is much more generally adopted. The chief entrances to it from the Coral Sea will be noticed.

The GREAT BARRIER REEFS form a coralline structure, unequalled in the world for their vast extent and formidable obstructions to navigation. From Swain Reefs, at their S.E. extremity, in latitude 22° 23′ 12″ S., long. 152° 36′ 54″ E., they may be said to extend nearly 1,000 miles in a general N.W. ¼ N. (*true*) direction, following in great measure the sinuosities of the coast as far as the latitude of Cape Direction (12° 51′ S.), when the barrier diverges from the coast in a northerly direction to Anchor Cay, its N.W. extremity, in lat. 9° 22′ S., long. 144° 6′ E.

The outer edge of the barrier, which is very steep-to, varies in distance from the coast; in lat. 21° 5′, it is distant from Port Bowen 140 miles; in 13° 56′, from Cape Melville, 15 miles; and in 10° 41′ S., from Cape York, 80 miles.

The general appearance of the Great Barrier Reefs is very similar, but a few feet rise and fall of tide make a very striking alteration. At low tide the surfaces of the reefs are nearly level with the water, with large masses of black coral rock (appropriately termed negro heads by Capt. Flinders) strewed over some of them; from atmospheric refraction, these appear much larger than they really are.

At all times of tide a heavy sea rolls on the windward side of the barrier, causing a very heavy surf, the spray and vapour arising from which impart a peculiar haze to the atmosphere in the vicinity.

None of these reefs can be classed with those called lagoon; they are extensive shallows, and on a calm clear day, at low water, a strip of the lightest

green may be traced as far as the eye can reach, indicating the trend of the reef, with occasionally small winding streaks of very deep blue, clearly pointing out the passages.

There are several small sand-banks on various parts of the Great Barrier, many of which are covered at high water, and others at half-tide; few were seen exceeding 5 or 6 feet in height at high water, and a still smaller proportion produced any kind of vegetation.

The Great Barrier Reefs may be seen in clear weather at a distance of 4 miles from a vessel's deck, and 6 or 7 miles from the mast-head. With a careful look-out and a commanding breeze no vessel need ever run into trouble; but at night more than ordinary caution is required, as it is scarcely possible to see the reefs at a greater distance than half a mile.

The sand-banks are seldom visible (in consequence of the haze over the reefs) until some time after the breakers are seen. It is at first difficult to discern what may be considered a good opening in the barrier, as from the points of the entrance often overlapping each other, they are not clearly made out until directly abreast of the passage; and from seaward the reefs, together with such openings, present one unvaried line of breakers.

It may not be here amiss to remark that although the lead should never be neglected in these seas, it must not be too implicitly trusted, as most of the reefs and coral patches (with which the northern part of the Inner Route especially abounds) spring up so abruptly from the bottom, that the lead frequently gives no warning of their vicinity before a vessel approaches too near to avoid them. *A keen look-out from the mast-head, cool judgment, and ready action* may therefore be urged as a general rule to ensure successful navigation amongst the reefs. To these hints it will be only necessary to add that a vessel should never be steered in the glare of the sun, except over such ground as may be safely navigated in the darkest night, as the glare makes it impossible to see the different colours of the water indicating dangers to be avoided.

A system of beacons has been recently adopted in the Inner Route, and several beacons have been established. In proceeding northward and westward, red triangular-headed beacons must be left to port, and black square-headed beacons to starboard.

The northern entrances to Torres Strait from the Gulf of Papua have been previously described. *Yule Entrance*, in lat. 10° 23′ S., long. 143° 56′ 30″ E., is about a mile wide, but is not to be recommended; the same with *Olinda Entrance*, in lat. 11° 15′ S.; *Pandora Entrance*, in lat. 11° 26′ 30″ S., may be used, should a vessel be drifted too far to leeward to enter by the Raine Island, or other passages to the southward.

RAINE ISLAND and Beacon, in lat. 11° 35′ 50″ S., long. 144° 2′ 20′ E., is 11 miles southward of the Pandora Entrance. The island is one-third of a mile long, nearly a quarter of a mile broad, and 20 feet above low water, the

reef extending $1\frac{1}{4}$ mile from its S.E. extreme. It may easily be known by the beacon on it, and is situated in the centre of the opening between the northern extreme of the Great Detached Reef and the projecting point of the barrier reef, N.E. by N. $8\frac{1}{2}$ miles from it. There is a clear channel on either side of the island, the southern being $3\frac{1}{2}$ miles, and the northern nearly 2 miles broad.

As no bottom could be reached with 125 fathoms in any part of this opening, nor close up to the lee of Raine Island, it affords no anchorage. It need hardly be observed, that the best landing place is on the N.W. side of the island.

The *beacon*, erected in 1844 by Capt. F. P. Blackwood, is a circular tower, 64 ft. high, built of stone quarried on the island; it consists of a series of chambers, one above the other, in which water and provisions were deposited, as the beacon was intended for the use of shipwrecked crews. It was painted with alternate red and black vertical stripes; the beacon, in clear weather, was then visible 8 or 9 miles from the deck.

The beacon was inspected by Captain Denham in March, 1860, when the dome had decayed and fallen; but it still presented a substantial tower, 60 ft. high, needing no restoration to adapt it to a lighthouse. In 1880, it was stated to be gradually falling into decay.

It is high water at Raine Island, on full and change, at $8^h\ 10^m$ by the shore, and $1\frac{3}{4}$ hour later in the stream; springs rise 10 feet. The strength of the stream sometimes exceeds 2 knots, the flood coming from the eastward; there is also, generally, a current setting 1 knot to the northward, along the face of the barrier.

A vessel proceeding to Torres Strait from the Outer Route, and intending to enter the Great Barrier Reefs by Raine Island, or by either of the adjacent openings, should be certain of her latitude, and if running in for Raine Island, should shape her course so as to make the beacon well on the starboard bow, in order to allow for the northerly current. When the beacon is clearly made out the island will soon be seen, and may be passed on either side, both passages being clear and easily navigated.

The beacon on Raine Island having been plainly made out, steer for the southern passage, which is much wider and far preferable to the northern. Having entered the southern passage, by not passing within $1\frac{1}{4}$ mile of the beacon, and having brought the beacon to bear North, distant about 1 mile, with the southern edge of Raine Island reef at about half a mile off, steer S.W. by W. $\frac{1}{4}$ W., carefully allowing for the tide stream, as well as the current to the northward, and a run of 9 miles from abreast of the beacon will bring the vessel into soundings, on the edge of the bank, passing at about half a mile to the northward of the northern extreme of the Great Detached Reef; the main body of the Great Barrier Reefs will then have been fairly entered.

Northern Passage.—Should a vessel be compelled to enter by the northern passage, she should haul up, so as to pass at about half or two-thirds of a mile

from the North side of Raine Island, and steer S.W. $\frac{3}{4}$ S., for 6 or 7 miles, or until the beacon bears N.E. $\frac{1}{4}$ E.; then by steering S.W. by W. $\frac{1}{4}$ W. for about 3 miles, the vessel will be on the edge of the bank, in the position before mentioned, when entering by the southern passage. Great care is here necessary to make due allowance for the stream and northerly set; and the beacon must not be brought to bear to the southward of East, in order that the shoal patches, lying 4 miles to the westward of Raine Island, may be avoided.

When the vessel has reached into soundings of 25 or 30 fathoms, in the entrance of *Blackwood Channel*, a good look-out from aloft must be kept for the small sunken patches which lie near the edge of the bank, on two of which was found as little as 12 and 14 feet at low water springs, but as they appear white, they will be easily seen from aloft, in contrast with the adjacent deep water.

The *Great Detached Reef*, which forms the southern side of the Raine Island Entrance, is $12\frac{1}{2}$ miles long N.W. by N. and S.E. by S., and at 8 miles from its southern end is *Yule's Detached Reef*, $6\frac{1}{2}$ miles in circumference, and 3 miles outside the barrier. It has deep water all round, and may be useful in pointing out the situation of some channels to the West of it; which need not be described here.

Wreck Bay is a deep circular bight on the reef, 12 miles from North to South. Its S.E. limit is marked by the two *Black Rocks*, in lat. 12° 12′ 30″ S., long. 143° 56′ E., which are 8 or 9 feet above the sea, and are good marks for making the bay from the southward. There is a broad opening in the S.W. part of Wreck Bay, which should be entered by closely rounding Black Rocks and then steering about S.W. by W. There is smooth anchorage in 16 to 20 fathoms, under the lee of the barrier.

There are several entrances, more or less advantageous, to the southward of this, but as it is presumed that no one will attempt the Inner Passage without a sufficient chart, which is indeed almost the only available guide, they need not be enumerated.

Providential Channel, through which Captain Cook passed, is in lat. 12° 39′ S., and from it Cape Direction Peak bears S.W. 20 miles; it is about a quarter of a mile wide, and although, like Bligh boat entrance, $12\frac{3}{4}$ miles to the southward, and Hibernia Passage, $5\frac{1}{2}$ miles South of it, too narrow to be considered good for vessels, it affords a quick way for entering; the exceedingly narrow reefs rendering the passage so short, that the transition from the heavy ocean sea to smooth water is instantaneous.

The chart will show the several openings through the reef to the southward. The outer edge trends generally to S.S.E. for 85 miles, when it turns to the eastward around Cape Melville, which is only 11 miles within the reef. The openings through the outer edge of the reef are safe, and lead directly from the open sea into the Inner Route, without any shoals in the way besides the

barrier, but they lie too far to the southward to be of any use to general navigation.

CAPE MELVILLE, the N.E. extreme of which lies in lat. 14° 10′ S., long. 144° 33′ 30″ E., is the northern termination of a high range of rocky hills, rising from 902 ft. high, at about a mile southward of the cape, to 1,740 ft. at 2½ miles farther inland. This singular promontory is remarkable for the heap of immense blocks of granite strewed over it, some of which look as if they had been thrown into the sea, forming a continuous border of foul ground, with rocks above water, from North Bay Point to the extremity of the cape, and extending from half a mile to 1¼ mile from the steep rocky shore.

Light.—A lightvessel, showing a *fixed bright* light, visible 10 miles, is moored on the North side of *Channel Rock*, about 1¾ mile N.W. by N. ½ N. of Cape Melville N.W. extreme.

From the elbow of the Barrier Reef to the N.N.E. of Cape Melville the outer edge trends to S.E. by E. for 66 miles to an opening, through which Captain Cook sailed in 1770, within which is the conspicuous Lizard Island.

LIZARD ISLAND is 2¼ miles long North and South, and 2 miles broad, and is remarkable for its peaked summit, of granitic formation, which being 1,167 ft. above the level of the sea, is an excellent mark for any vessel entering the Inner Route from seaward, through the safe opening in the Great Barrier Reefs to the eastward of the island. The bêche de mer fishery is carried on here.

Capt. Owen Stanley's spot of observation was at the South end of the sandy bay on the West side of Lizard Island, in lat. 14° 39′ 56″ S.. long. 145° 30′ 10″ E. It is high water at Lizard Island, on full and change, at $9^h\ 15^m$; rise from 7 to 10 feet.

There are several openings in the reef hereabout. Captain Cook's Channel is half a mile wide, and N.E. ½ N. 9½ miles from Lizard Island peak.

From this the outer edge of the Barrier Reef trends to S. by E. for 115 miles to Trinity Opening. Parallel with the coast off Cape Tribulation, or in about lat. 16° 17′ S., the reef begins to lose the uniform and well-defined character it has to the northward, and there are numerous openings which may be used if desirable.

About 33 miles northward of Cape Tribulation is *Endeavour River*, at the mouth of which is *Cooktown*, the port for the mining district of Palmer River, from which much gold has been obtained. The town had a population of 2,185 in 1876. The river has a bar, with 10 ft. on it at low water. Vessels cannot enter without a pilot. Two leading lights are shown on the wharves.

Lights.—On *Archer Point*, 10 miles southward of Endeavour River, is a lighthouse, showing a *fixed* light, visible 20 miles, and on *Rocky Islet*, about 1 mile S.E. by S. ¼ S. of it, is a *fixed* light, visible 14 miles when in line with Archer Point light.

Trinity Opening is a broad channel leading from the sea into Trinity Bay,

between Oyster Cay and an extensive reef 10 miles to the north-westward of it. The soundings are irregular, varying from 14 to 31 fathoms; the 100-fathoms edge of the bank being about 12 miles outside the centre of the opening. A small reef, with a patch of sand on it, lies W.N.W. 6½ miles from Oyster Cay; and at 3½ miles N.E. by N. ½ N. from the cay is a small sunken patch at about a mile from the edge of the reef; besides these, numerous detached reefs and patches of coral lie scattered in mid-channel; and as it has not been closely sounded, many other dangers probably remain undiscovered in it.

Light.—On the westernmost *Low Islet* in Trinity Bay is a white lighthouse, showing a *revolving bright* light, attaining its greatest brilliancy every minute, elevated 65 ft., and visible 14 miles.

Cape Grafton is 20 miles southward from the middle of Trinity Opening, and the land about it may be easily recognised, when seen from the southward, by its appearing like three lofty islands. The outermost eminence is *Fitzroy Isle*, but the others are lofty ridges upon the mainland, the north-easternmost of which, 1,273 ft. high, forms the cape, and is rocky and sterile; but it is conspicuous from having two small peaks, close together, on the West extreme of its summit. The northern summit of the outer ridge forming Cape Grafton is in lat. 16° 52′ 35″ S., long. 145° 57′ 20″ E.

The outer edge of the Barrier Reef to the S.E. of this has not been examined and for 460 miles the imperfect charts are the only guide. But the Inner Channel and the coast have been surveyed more or less completely.

THE COAST OF QUEENSLAND.

This coast, and the intricate reefs and islets which lie off it, would require a very long description to enumerate them, and then it is probable that the charts would be a better guide. Should such verbal directions be necessary, they will be found in the second volume of the Australian Directory, by Commander C. B. Yule, R.N., which is principally devoted to elaborate accounts of this intricate navigation. What follows will only refer to the more prominent points of the coast.

ROCKINGHAM BAY, which lies between Cape Sandwich (the N.E. extreme of Hinchinbrook Island) and Dunk Island, N.W. by N. ¼ N. of it, is 16 miles wide, and 14 miles in depth. It is easily distinguished by the heights of Hinchinbrook Island, and the numerous elevated islets lying near its entrance; it is also easy of access, as there are no hidden dangers, and the soundings are regular, from 9 to 3½ fathoms, sand and mud; but it is exposed to easterly gales, and affords no other shelter from those winds than may be found under the lee of the North point of Hinchinbrook, or the N.W. side of Goold Island.

Fly Point, a shelving rock at the South end of a small sandy beach, on the West side of Goold Isle, in the southern part of the bay, which was the spot selected by Capt. F. P. Blackwood for astronomical observations, lies in lat. 18° 9′ 20″ S., long. 146° 11′ 30″ E.

HINCHINBROOK ISLAND, which is separated from the mainland by Rockingham Channel, is mountainous, 20 miles long, S.E. ½ E. and N.W. ½ W., and from 5 to 9 miles broad. The East coast is steep, and rises abruptly to mountains, attaining, according to Capt. Stokes, an elevation of 2,500 ft.

Rockingham Channel, which separates Hinchinbrook Island from the mainland, extends from its S.E. entrance about 28 miles north-westward to its opening into Rockingham Bay, and is from 1 to 3 miles broad. There is deep water within; but as a bar, with generally heavy rollers breaking upon it, extends across its S.E. entrance, the channel may be considered quite unfit for large vessels to attempt entering the bay by it.

The western shore of Rockingham Channel consists of mangrove swamps, cut up by winding creeks, and backed by a continuation of the range of high rocky hills extending to the north-westward from Mount Eliot.

The shore is bold for the first 10 miles of the North side of the south-eastern part of Rockingham Channel, and rises to the lofty hills which extend across the southern end of Hinchinbrook Island; but the remaining portion of the eastern shore is low, and fringed by a belt of mangroves.

Cardwell township, laid out in 1864, is on the coast abreast of the N.W. point of Hinchinbrook Island. In 1881, the population of the town and vicinity was 1,330. The harbour is considered one of the finest in Queensland, and a jetty, 2,000 ft. long, extends from the beach.

Cape Cleveland, in lat. 19° 11′ 15″ S., long. 147° 1′ E., is a hilly headland rising from the open forest plain, which is separated from the mainland by Crocodile Creek. The North extreme of the cape forms a narrow hilly point, from whence the high land extends 6½ miles to the southward.

Light.—On Cape Cleveland is a white lighthouse, showing a *revolving bright* light, attaining its greatest brilliancy every 20 seconds, elevated 210 ft., and visible 20 miles. An arc of 16° of *red* light is shown over Salamander Reef.

A reef, with two dry rocks upon it, the eastern of which is 4 ft. nigh, extends E. ½ N. 3 miles from the North extremity of Cape Cleveland.

Cleveland Bay, immediately on the West side of Cape Cleveland, extends W. ¾ S. 13½ miles from the cape to the N.E. extreme of Cape Many Peaks, and is 6½ miles deep. There is 3½ to 6 fathoms across the entrance.

The bay affords good anchorage in all parts, in 4, 5, and 6 fathoms. A considerable flat extends from the shore on the western side of the cape, and is left dry at half ebb; it fronts a sandy beach that commences at 1½ mile to the South of the cape, and extends to the southward for nearly 2 miles. Over this beach two or three streams of fresh water run.

A great drawback is the openness of the anchorage, large vessels and even the inter-colonial steamers having to lie 3 miles off shore. Breakwaters are now in course of construction, and a passage is to be dredged to the wharves.

Townsville, a municipal town, was proclaimed in 1866, and in 1881 contained a population of 3,032. It is situated on Ross Creek, at the foot of a hill which rises to an altitude of 935 ft., on the shore of Cleveland Bay. In 1882 the Northern Railway was opened from Townsville to Charters Towers, 70 miles inland, in the gold district.

Two *lights* are shown at the entrance to Ross Creek; the East light *bright*, and the West light *red*.

The N.W. Mouths of Burdekin River are three creeks which communicate with Cleveland Bay between 5 and 9 miles south-westward of the North point of the cape. The central, which forms the N.W. entrance of Crocodile Creek, carries 3 to 4 fathoms for 5 miles from the entrance; but it is fronted by a flat, with 6 to 12 ft. water, extending 2 miles from the shore.

It is high water in Cleveland Bay, on full and change, at $9^h\ 30^m$; springs rise from 5 to 12 ft.

CAPE BOWLING-GREEN—or, as it would be more correctly expressed, Bowling-Green Point—is the North extreme of an extensive, low, level projection of the mainland, 26 miles E. by S. from Cape Cleveland, and N.W. 30 miles from the N.W. point of Cape Upstart. A shoal, dry at low water, extends 1 mile to the northward, and a spit projects about the same distance to the westward from the cape.

LIGHT.—A light-tower, 73 ft. high, painted white, stands on the sand ridge at the northern extremity of the cape, and shows a *revolving bright* light, attaining its greatest brilliancy every minute, which should be visible 14 miles.

Bowling-Green Bay, on the West side of Cape Bowling-Green, is 26 miles broad, W. by N. from Cape Bowling-Green to Cape Cleveland, and about 11 miles in depth; but shoals, with irregular depths of 1 to 5 fathoms on them, occupy the greater portion of the bay, stretching out northward to a line extending W. $\frac{1}{2}$ S. from Cape Bowling-Green.

The Central Mouths of Burdekin River are two entrances of this river, one in the S.E., and the other in the S.W. bight of Bowling-Green Bay.

Cape Upstart, in lat. 19° 42′ 49″ S., long. 147° 46′ 44′ E., was very appropriately named by Capt. Cook, from the remarkable abruptness with which it rises from the low swampy ground, which is separated from the mainland by the creek between Abbott and Upstart Bays. The high land of the cape extends $6\frac{1}{2}$ miles East and West, and 4 miles across, and is chiefly composed of a mass of granite rocks, scantily covered with stunted trees and scrub. Its summit, which is somewhat table-topped, is severed by a deep gorge across it. *Station Hill*, the highest part of Cape Upstart, near the S.W. extreme of the heights, is 1,900 ft. above the level of the sea.

Upstart Bay, an indentation of the flat country immediately to the west-

ward of Cape Upstart, is 10 miles broad East and West, and 8 miles in depth. The mangrove shore forming the bight is intersected by numerous salt-water creeks, with shoals extending a considerable distance from their mouths.

Wickham River flows into Upstart Bay at 9 miles westward of the cape, and is fronted by a bar with two small islets on it, at 2 miles within which is a larger islet, lying in the mouth of the river.

Mount Abbott, 23½ miles to the southward of Cape Upstart, is remarkable, and estimated by Capt. F. P. Blackwood to be 3,460 ft. high. *Mount Aberdeen*, 3,250 ft. high, rises E.S.E. 12 miles from Mount Abbott, from whence a rocky mountainous range extends south-eastward to within 7 miles of the West side of Repulse Bay.

PORT DENISON, which was established in 1861, is a well sheltered and commodious harbour, 33 miles south-eastward of Cape Upstart, and between 3 and 6 miles southward of Cape Edgcumbe. It is sheltered from the eastward by Stone Isle, which divides the approach to the port into the North and South entrances, the latter being the wider and deeper channel.

North Entrance, which is nearly half a mile wide, lies between Stone Isle and the North point of Port Denison. *North Head* is a conical, peaked, granite islet, 80 ft. high, with a ledge of rocks covered at high water, extending a quarter of a mile to the south-westward. *South Head* is a hillock, sloping down into a mangrove gully, in the centre of Stone Isle. There is 19 to 25 ft. water in the outer part of the entrance, and 14 to 18 ft. farther in.

Light.—On North Head is a white tower, 30 ft. high, showing a *fixed bright* light, visible 11 miles in all directions seaward, except between N. by W. ¾ W. and N. ¼ E., and between S.S.W. and S.W. by W., where it shows sectors of *red* light.

Two black nun buoys mark the 12-ft. edge of the reef bordering South Head; and two red nun buoys mark the 12-ft. edge of the spit, extending from Dalrymple Point, the North extreme of Port Denison. In entering, all black buoys are kept on the port hand, and red on the starboard.

The *Pilot Station* is at the North entrance, where a pilot may be obtained when the sea is too heavy for him to board a vessel outside.

Stone Isle is 1 mile long W.N.W. and E.S.E., and about half a mile broad, and 86 ft. high. Shoal-water Bay forms the N.E. side, and Observatory Point projects from the S.W. side of the island. A shoal of coral patches extends half a mile southward from the island, with two red buoys, one on the S.E., and the other on the N.W. edge, and a shoal spit, with a red beacon on it, runs out about one-third of a mile from Observatory Point.

South Entrance is 2¼ miles wide between the East end of Stone Isle, and Thomas Islet to the southward, which is 30 ft. high, and lies East three-quarters of a mile from the low South point of Port Denison; but at about a mile within the entrance, the channel, with 3 to 5 fathoms water, is contracted to two-thirds

of a mile in width, by the coral patches southward of Stone Isle, and the coral flat extending from the South shore of the port.

Within the entrances, Port Denison contains an area of about 3 square miles, with $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, mud; but the low shores, belted to the southward with mangroves, are fronted by a shallow flat, making landing difficult, except at high water. The anchorage is so shoal that vessels of moderate draught must lie a long distance from the pier.

The most convenient anchorage, in 16 or 17 ft., appears to be at about one-third of a mile south-westward of the North point of Port Denison, and at a quarter of a mile north-westward of Observatory Point.

The country near the township of *Bowen*, and beyond the mangrove swamps, consists of a rich, light, and sandy soil. A pier, one-third of a mile in length, is constructed for the use of vessels loading and discharging; at night a *red light* is shown on it. The land under cultivation in the district is principally used for the growth of cotton and sugar-cane. Water is scarce, and no supplies, except beef, were procurable.

There are, as already described, two ways for entering Port Denison; the North entrance, which is available for small vessels, and the South entrance for vessels of greater draught; and this being the wider, deeper, and windward channel, is to be preferred to the North entrance. Due allowance must be made for the ebb stream, which sets upon the reef extending southward from Middle Isle.

To the S.E. of this there is a labyrinth of islands and channels off the coast, which a long verbal account would not properly describe. This must be left for the Australian Pilot. The principal groups are *Whitsunday Island*, the various clusters composing the *Cumberland Islands*, to which succeed the *Northumberland Islands*. These various islands and rocks form two general channels, one exterior to the groups, through which the Inner Channel to Torres Strait, &c., passes.

Light.—On the West side of *Dent Island*, Whitsunday Passage, is a white lighthouse, showing a *revolving bright* light, attaining its greatest brilliancy every half minute, elevated 120 ft., and visible 16 miles.

MACKAY or Pioneer River, which is only accessible to coasters, has a bar across its mouth, which dries at springs. From the bar the depth of the channel, which has an average width of 1 cable, varies from 1 ft. to 5 ft. at low water, until within about three-quarters of a mile of the town, situated 4 miles above the bar, when it again almost dries across, and from thence the depth gradually increases until abreast of the town, where there is about 6 ft. at low water, in the centre of the channel. A pilot and boat are stationed at the entrance of Pioneer River; and buoys and beacons mark the changes caused by occasional heavy freshes.

The town of Mackay, proclaimed first in 1869, in 1881 contained a popula-

tion of 2,075, and the district within a radius of 14 miles of the township was extensively cultivated with sugar, tobacco, &c.

Lights.—Off the entrance of the river a *fixed bright* light is exhibited from the signal station on Flat Top Island, elevated 174 ft. above the sea, and visible 19 miles, except between S.E. by E. $\frac{3}{4}$ E. and S.E. by E. $\frac{1}{4}$ E., when it is obscured by the island. The light is *red* between S.E. $\frac{1}{2}$ S. and S. by W., and between N. $\frac{1}{2}$ E. and N. by E. $\frac{1}{4}$ E. over Llewellyn Shoal. Two *bright* lights vertical on the Pilot station flagstaff, and repeated at Flat Top Island, signify the bar is dangerous. During moderate S.E. winds shelter will be found under the lee of Flat Top Island, taking care to avoid the sand-spit extending from its South end. To reach it bring the white beacons on the East point of Pioneer River in line W. $\frac{1}{2}$ S., and steer towards them until the beacons on the S.W. part of Flat Top Island come in line S. $\frac{1}{4}$ E.; then alter course to S. by W. until Flat Top Island lighthouse bears S.E.; a vessel can then anchor in not less than 18 ft. at low water springs.

In proceeding for Pioneer River from the northward, carefully avoid a dangerous reef, nearly midway between the islets off the river and the rocky islet to the northward, which lies 2 miles south-eastward of Slade Point. There is, however, a clear passage between this reef and the main land, and also between the rocky islet to the northward of it and Slade Point.

It is high water on Pioneer River bar, on full and change, at $11^h\ 7^m$; springs rise from $10\frac{1}{2}$ to 16 ft., and at the town, 6 to 12 ft. The streams in the river run from 3 to upwards of 4 knots.

PORT BOWEN is the next point of interest which lies upon the exterior coast. Round Islet, off Cape Clinton, is in lat. 22° 31′ 15″ S., long. 150° 50′ E.

Cape Clinton is the eastern point of a peninsula, forming the South side of the entrance of Port Bowen. From seaward it has the appearance of a bold head, the hills on it being from 400 to 500 ft. in height. From Cape Clinton a cliffy shore, skirted by numerous detached rocks, which are bold to approach, extends a mile north-westward to a small sandy bay, the West side of which runs out to a point, forming the North extreme of Clinton peninsula.

Round Islet, a quarter of a mile to the northward of Clinton Point, is small and triangular at the base, and is 123 ft. high, with steep cliffy sides; the sea face is bold to approach, but a 3-fathoms spit projects from its North point. The islet is nearly connected with the point by a chain of low rocks.

Port Bowen, a deep inlet in the main land, can be easily distinguished from seaward, from its being nearly midway between the lofty peaked heights at the back of Cape Manifold, and Mount Westall, 1,820 ft. high, N.W. by W. $\frac{1}{4}$ W. 16 miles from Cape Clinton. The entrance lies between Round Islet and a perforated rocky point, which bears N.W. by N. $\frac{3}{4}$ N. nearly $2\frac{1}{2}$ miles from the islet, and projects to the south-eastward from a barren hilly headland at the North end of the port. Port Bowen is difficult of access for large

sailing vessels, on account of a bar, but inside there is anchorage, sheltered from all winds.

Entrance Island, which is small and rocky, lies nearly 1 mile to the eastward of Perforated Point; it is nearly half a mile long, S.E. and N.W., and forms a good distinguishing mark for the entrance of Port Bowen, as it rises to two hills 190 ft. high, clothed to their summits with fine pine trees; these trees readily engage the attention of a stranger, as this is the southernmost locality along this coast where pine trees have been seen.

The Bar extends from Round Islet the whole way across the entrance of Port Bowen to Perforated Point; the southern part bends out to the eastward, and is from 1½ to 2 cables broad. The depth of water on the bar varies from 12 to 17 ft., on a yellow, gritty, sandy bottom; but there are some very small knolls, with 6, 9, and 10 ft. on them, upon which the sea breaks in a fresh breeze; in smooth water these are easily discerned by the tide ripplings over them.

The only secure anchorage in Port Bowen is to the southward of Inner Head, where it is well sheltered from all winds, and from the heavy swell which occasionally sets in over the bar.

Port Bowen cannot be considered a good harbour for all classes of vessels, in consequence of its barred entrance, and it is possible that the banks are of a shifting nature. Repairs could be executed here, there being excellent pine timber on Entrance Island.

KEPPEL BAY, 57 miles southward of Port Bowen, is situated between the N.W. end of Curtis Island and the main land; its southern part forms the estuary of five considerable creeks or arms of the sea, penetrating into the low swampy country to the westward of Curtis Island. The eastern arm forms the N.W. entrance of the narrow strait separating Curtis Island from the main land; but it dries at low water, at about 6 miles from the entrance; all the other openings are navigable, the depth ranging from 3 to 8 fathoms.

Cape Keppel is a small hummock, 10 miles West of Cape Capricorn; the intermediate coast is low and broken by several creeks. Shoal water extends from the shore out to a line between the two capes, where there is a depth of 4 fathoms. A shoal, with 3 fathoms water on it, lies 1½ mile to the north-eastward of Cape Keppel, and at about the same distance to the north-westward of the cape are some rocks above water.

Cottier Bank, 3 miles N.E. ½ E. of Cape Keppel, is marked by a black buoy on its outer edge.

From Cape Keppel a low coast, backed by grassy hills, with some duck ponds in the hollows, trends south-westward 5 miles to the foot of Sea Hill, the N.W. extreme of Curtis Island; a low point, with rocks off it, stretches out midway; and a small salt-water creek runs into the island immediately to the southward of Sea Hill. A bank, on which are several patches of dangerous

rocks, extends from the rocks off Cape Keppel to Sea Hill; it is steep-to, and the rocks on it are but partly visible at low water.

FitzRoy River. which flows into the S.W. part of Keppel Bay, is navigable for small steamers and coasters about 35 miles, to *Rockhampton*, an important town, with a population of 7,435 in 1881, which may be considered the capital of northern Queensland. It is the port of shipment for a large extent of back country, and the starting point of the Central Railway, which in 1884 was about 250 miles long, extending to Pine Hill. Vessels lying in the bay ship their cargo from lighters, but only in fine weather.

The *Pilot Station* is situated on the point, midway between Cape Keppel and Sea Hill; and vessels are boarded by the pilots, off the Keppel Rocks.

Two *fixed bright lights* are shown at this pilot station; they are 200 yards apart, and shown from red wooden stagings. In one they bear S.E. ¼ S., and point out the direction of Timandra Bank buoy. Two small *bright* lights are shown at Little Sea Hill to assist in passing Timandra Bank.

The shores of Keppel Bay, and of the several arms into which it branches, are low, swampy, and covered with mangroves, so that there are few places where it is not necessary to wade some distance in soft mud, and afterwards cut through a barrier of mangroves, before reaching the solid land.

A Lightvessel is placed within and near the entrance of FitzRoy River, showing a *fixed bright* light, elevated 44 ft. and visible 8 miles. The vessel is moored in 7 fathoms, 4¼ miles S.W. ¾ S. from Little Sea Hill Point.

A vessel going into Keppel Bay will be much deceived by the colour of the water, for the shores of the bay being soft and muddy, the water running out by the deep channels with the latter part of the ebb, is thick, whilst the more shallow parts, over which the stream does not then set, are covered with clear sea-water. Not only are the shores generally muddy, but a large portion of the bay itself is occupied by shoals of mud and sand. The deepest water is in the channels running out of the different arms already mentioned. The broadest of these channels, which is on the East side of the bay, is about 2 miles wide, and affords good anchorage in 6 to 3 fathoms just within the entrance, with Sea Hill bearing N.E.

More extended descriptions have been given by Commanders John Jeffrey, R.N., and G. S. Nares, R.N., but they need not be repeated here. Their directions follow.

A ship from the southward entering Keppel Bay with a fair wind should round Cape Capricorn at the distance of half a mile; she will then have Cockscomb Hill open North of the Second Lump (Peak Island), bearing W. by N. ½ N.; this mark will lead clear of Cottier Bank and all the shoal water extending from Curtis Island.

When Broad Mount comes on with the outer Keppel Rock, bearing W. by S. ½ S., she will be within half a mile of the black buoy on Cottier Bank, and may steer W. ¾ S., which will lead to the black buoy on Timandra Bank; the

lead should be kept going, as this course will lead along the edge of shoal water. A pilot will endeavour to come on board after vessels have passed the Keppel Rock; but failing to obtain a pilot, and the weather being fine, it is desirable to anchor and wait for one; or if night is coming on, and the weather doubtful, to stand off and on until daylight.

Ships from the northward should pass outside the Keppel Islands; there is nothing to be gained by venturing inside, where the water is shoal, and likely to be altering in depth after and during the rainy seasons.

At night, after passing Keppel Rocks, on a West course, be careful not to bring the two lights at the pilot station in line before crossing the line of lights at Little Sea Hill. When both these lines of lights are crossed, which should be done within a short distance of the point of intersection, the Timandra Bank buoy will be passed; then steer S.S.W. for the lightvessel, and, if intending to anchor under Little Sea Hill Point, haul up when the upper light is eclipsed on a S.E. $\frac{1}{2}$ S. bearing, and steer S. by E. $\frac{1}{2}$ E. While standing in this light will again be visible, and when it bears N.E. anchorage will be found in 5 fathoms at low water. Between Little Sea Hill Point and Timandra Bank buoy the tides set strongly across the line of lights at Little Sea Hill.

When at the buoy on Timandra Bank, South Hill should be in line with the point of Little Sea Hill, bearing S. $\frac{1}{2}$ W.; vessels drawing more than 12 ft. water should not venture further without a pilot. There are several knolls with 15 ft. on them; and during the heavy freshes of the rainy season banks are thrown up, and others washed away.

Wood is easily procured; and fresh water may be found in small ponds and swamps, at a little distance behind the beach.

It is high water at the pilot station, on full and change, at 9^h; springs rise 11 ft., neaps 7 feet.

CAPE CAPRICORN, so named by Capt. Cook, from its geographical position, which is in lat. 23° 28′ 30″ S., long. 151° 15′ 30″ E., is of considerable height, and looks white and barren. It is an electric telegraph and signal station. Two islets lie 4 miles S.E. $\frac{1}{2}$ E. of it, one rocky, and the other composed of rock and sand, between which and the shore is a depth of 7 and 8 fathoms. Other islets lie to the north-westward of the cape. The cape may be approached to the distance of a mile, in from 9 to 11 fathoms.

LIGHTS.—A *revolving bright* light is shown from a round stone-coloured tower, 39 ft. high, on Cape Capricorn, at an elevation of 310 ft., attaining its greatest brilliancy every minute, and visible 23 miles.

On the N.W. slope of the cape is a *fixed bright* light, elevated 100 ft. and visible 14 miles. This light in line with the main light E. by S. $\frac{3}{4}$ S. leads northward of Cottier Bank.

CAPRICORN GROUP.—At 33 miles N.E. by E. $\frac{1}{2}$ E. from Cape Capricorn is the N.W. islet of a group thus named by Capt. F. P. Blackwood, from its central portion being on the tropic. It is a cluster of small islands and reefs

which are continuous with the *Bunker Group*, of three similar coral islets; together they occupy an extent of 54 miles in a N.W. and S.E. direction, or nearly parallel with the coast. To the northward of this line of islands is the wide Capricorn Channel, an excellent entrance to the Inner Route; to the South of them is the Curtis Channel, well marked at the entrance by Lady Elliot Island and its lighthouse.

North Reef, the northernmost of the Capricorn Group, in lat. 23° 11′ S., long. 151° 56′ 10″ E., is merely a sand-bank, a few feet above high water, with some stunted bushes on its centre, visible at about 7 miles from a vessel's deck; it is surrounded by a reef 1 mile in diameter.

LIGHT.—On North Reef is a white tower, 80 ft. high, showing a *fixed* and *flashing bright* light, elevated 72 ft. above high water, and visible 13 miles. The light is fixed for 2 minutes, followed by two flashes in succession at an interval of 1 minute, the series of changes occupying 4 minutes.

North-west Islet is about 13 miles S.W. by W. from North Reef, and lies on the West end of a coral reef 6 miles long and 2 miles broad. The trees on it are about 50 ft. high.

Mast-head Islet, the south-westernmost of the Capricorn Group, lies nearly W. by S. ¼ S. 20½ miles from One Tree Islet, and is three-quarters of a mile long East and West, and one-third of a mile broad. It is thickly vegetated to the margin of the sandy beach, and the tops of the trees are about 50 ft. high. It lies on the West end of a reef of oval shape, about 2½ miles long East and West, and 1½ mile broad; the reef is steep-to. *Heron Islet*, 12 miles N.E. ¾ E. from Mast-head Islet, is the most central, elevated, and densely wooded of the group, the tops of the trees being 60 ft. above high water.

The three islets of the Bunker Group are generally similar in appearance. There are clear and spacious channels between them, with fair shelter under their lee in heavy gales, but there is little necessity for coming among them; a good look-out is the best guide.

LADY ELLIOT ISLET is a small coral island, in lat. 24° 7′ S., long. 152° 45′ 30″ E., and N.W. 45 miles from the lighthouse on Sandy Cape, and S.E. by E. ¾ E. 23 miles from the south-easternmost of the Bunker Group. It is half a mile in circumference, and covered with scrub and stunted trees, which attain an elevation of 50 ft. above high water; the surface of the islet being about 15 ft. above the same level. The islet is encircled by a coral reef, which stretches out half a mile to the northward and eastward; and a long coral spit runs off its N.E. point.

Lighthouse.—On the S.W. side of Lady Elliot Island is a white iron tower, 45 ft. high, from which a *flashing bright* light is shown, every half minute, at an elevation of 60 ft., and visible 12 miles.

CURTIS ISLAND is 25 miles long, and 13 miles wide near its N.W. end; the S.E. part is the most hilly, the greater portion of the island being low, and in some parts swampy. From Cape Capricorn, a low and rather sandy coast

trends 17 miles S.S.E. to the East point of Curtis Island, forming the West point of the North entrance to Port Curtis.

North Entrance is the opening which separates Facing and Curtis Islands; a small rocky islet, with a rock above water, lies in the northern mouth of the opening, where it is nearly 1 mile wide; the breadth then increases southward to 3 miles, between Bushy Islet and Quoin Island, which lies W.N.W. 3½ miles from the islet; but the opening is so full of shoals, and the tide streams run with such strength, that it only affords a passage for boats into Port Curtis.

View Hill, is a conspicuous object, 460 ft. high, rising on the S.E. extreme of Curtis Island; one ridge descends from it south-eastward, terminating at a point a quarter of a mile to the northward of Quoin Island, and another towards the East point of Curtis Island.

Facing Island, which forms the greater portion of the N.E. side of Port Curtis, is 8 miles long N.N.W. and S.S.E., and 2¾ miles broad at its central part. On its South extremity, Gatcombe Head, is a lighthouse, a guide into Port Curtis. As the usual route to this is from the S.E., Bustard Head light, 20½ miles to E.S.E., was established.

BUSTARD HEAD, N.W. ½ W. 10 miles from the bluff called Round Hill Head, is a double point of moderate elevation, with numerous rocks extending 2½ miles northward of it, but within the *Outer Rock* above water there is a depth of 14 fathoms, with room for a vessel to pass.

The Lighthouse on the S.E. point of Bustard Head is a white tower 58 ft. high, showing a *fixed* and *flashing bright* light at an elevation of 330 ft., visible 24 miles. The light shows steadily for one minute, then is partially eclipsed, then a much *brighter flash* of a few seconds duration, then another eclipse, then the steady light, the whole of the changes occupying two minutes. As this is the period of the Sandy Cape revolving light, it is necessary to be particular in distinguishing them.

A 5° *red sector* of light is shown (during the period the steady light is seen) in a N. ½ E. direction over Outer Rock. This rock is also denoted by a peculiar arrangement of a light, shown from a square lighthouse, 500 yards S.E. by S. from Bustard Head lighthouse. The light from this tower is shown at an elevation of 280 ft., between N. by W. ¾ W. and N.E. ¾ N., but is visible as far as East. It is so screened, however, between N.N.E. and N. by W. as not to be visible southward of a position a mile outside the Outer Rock. Vessels, therefore may give Outer Rock a berth of a mile on its northern side by keeping this light in sight while passing through the red sector shown from Bustard Head lighthouse.

Between N. by W. ¾ W. and N.W., where the low light is obscured by the land, the deficiency is made good by a second light placed 160 yards W.N.W. of the main light; this light is screened off when approaching the rocks near the head.

Bustard Head light also shows a red sector from W.N.W. towards the land,

and from the low lighthouse the light is also shown between N.W. and W.N.W. By keeping Bustard Head bright light in sight when between Bustard Head and Gatcombe Head, the dangers off Rodd Peninsula and the East Banks at the entrance to Port Curtis will be avoided.

To the West of Bustard Head a low coast, rising to barren hummocky hills, partially covered with stunted trees, trends to the westward 5 miles, when it becomes fringed by a shoal, and, turning to the southward, runs out to a low sandy point, forming the North side of the entrance of Rodd Bay. Middle Head, the opposite side of the entrance, is a projection of the mainland, as picturesque as it is prominent. *Rodd Bay* has a small harbour running into the eastward, between Sandy Point and Middle Head, and afforded good shelter for vessels of less than 9 ft. draught. The channel lies between two sand-shoals extending from either shore.

Hummock Hill, W.S.W. 1¾ mile from Middle Head, being 430 ft. high, and within a mile of the shore, is a useful mark for making Rodd Bay, or the South Channel leading to Port Curtis.

Seal Rocks, N. ¼ E., nearly 4 miles from Hummock Hill, are a cluster of rocks scattered over a space extending 1½ mile N.E. and S.W., and nearly half a mile broad; they are of great use to vessels, as a mark for entering the South Channel to Port Curtis, as some of the rocks are from 6 to 8 ft. above high water, and may be approached on the N.W. side within a quarter of a mile, by vessels not drawing more than 18 ft. At night they are cleared by observing the Bustard Head light, before described. They are now marked by a *beacon*.

Jenny Lind Shoal, with two rocks showing at low water, lies at about 1½ mile to the north-eastward of the central rock, with from 4 to 5 fathoms between. A black conical buoy lies in 6 fathoms off its northern edge.

From the first inlet to the westward of Hummock Hill the coast trends nearly N.W. by W. 4½ miles to Red Cliff, which has a small creek on either side of it.

PORT CURTIS, one of the safest and most capacious harbours in Queensland, is situated between Facing Island and the mainland; the approach to it is somewhat difficult for a stranger, on account of the East Banks stretching nearly across from Seal Rocks to Facing Island. There is a ship channel at either end of the shoal—South Channel, passing to the northward of Seal Rocks; and North Channel, close round Gatcombe Head, the S.E. extreme of Facing Island. Having once entered the harbour, there is security for any number of vessels of the largest size. Vessels requiring a pilot to enter the port should signal to the light-keeper at Bustard Head, who will telegraph to the pilot at Gladstone.

The northern edge of *South Trees Point*, a low projection of the southern shore of Port Curtis, N.W. by W. ¾ W. 11¼ miles from Seal Rocks, is bold

to approach, but is only remarkable from having a few stunted trees growing upon it.

West Banks are covered with sand-banks extending from between 1½ and 2½ miles north-eastward of Red Cliff to South Trees Point. A narrow ridge runs along nearly the whole length of these banks, with from 1 to 5 ft. water upon it.

South Channel, the principal channel leading into Port Curtis, begins between Seal Rocks and the S.E. extreme of East Banks, where it is 1¼ mile broad, with from 4 to 6 fathoms water, but some 3¾-fathoms patches lie midway between; it then runs nearly W.N.W. to the entrance of the harbour, the breadth varying from three-quarters of a mile to 1 mile, and carrying from 4 to 11 fathoms, sand.

East Banks, which lie between the two channels leading into Port Curtis, are 6 miles long and 2 miles broad, and the least depth of water on them is 1 foot. A red buoy is placed in 3 fathoms, on the S.W. edge.

North Channel passes between the S.E. extreme of Facing Island and the N.W. end of East Banks, and is from a quarter to half a mile broad, with depths of 4 to 6 fathoms in it. Although this is considerably shorter than South Channel, the latter is to be preferred, especially for large vessels, as it is broader and deeper, and the tide streams are not so strong as in North Channel, where they run from 2½ to 3 knots. A 3-fathoms patch lies near the middle of the channel.

Gatcombe Head, the S.E. extreme of Facing Island, is a bold and conspicuous bluff, N.W. by W. ½ W. 7⅓ miles from Seal Rocks. Its summit, *Signal Hill*, 245 feet high, is an excellent mark for making out the entrance of Port Curtis; there is a signal station on it. *Oyster Rock*, a detached rock above water, lies about a cable's length off the head.

The first projection to the N.E. of Gatcombe Head is Settlement Point, distant about three-quarters of a mile; it was so named by Lieut.-Colonel Barney, R.E., having established a temporary settlement on it in 1846.

Lights.—A white lighthouse, 30 feet high, stands on the S.E. part of Gatcombe Head, in lat. 23° 53′ 4″ S., long. 151° 23′ 45″ E. It shows a *fixed* light, which is *bright* seaward, but *red* from N.E. ½ N. to E. by N. ½ N. over the entrance, and also between S.W. and S.S.W. From the West side of the Pilot's dwelling on the head, a *fixed bright* light is shewn, elevated 80 feet, obscured when bearing eastward of E. by S. ¾ S.

Oyster Rock Light, reflected from the shore, is exhibited from a red beacon 21 ft. high, on Oyster Rock, 2 cables S.S.W. of Gatcombe Head lighthouse. The light appears *fixed bright*, visible over East Banks or from N.E. by E. ½ E., by E., to S.E. by S., and from S. by W. to W. by S. ½ S.; it is elevated 18 ft above high water, and is visible 4 miles. When within a mile of the rock, the eye must be raised to the level of the light to obtain its full power.

The light kept open, bearing S.W. by W. ½ W., clears the rocks and buoy

off Settlement Point, and when in one with Gatcombe Head light bearing N. by E. clears the junction buoy,

Vessels coming from the southward should, while keeping outside the East Bank, by not opening the red light of Bustard Head, and in not less than 8 fathoms water, steer to the westward, until the light on Gatcombe Head is seen as a red light. By day the East side of East Banks will be cleared by keeping the North end of a clump of casuarina trees on the East side of Facing Island, midway between Ship and View Hills, W.N.W.

At night, to enter Port Curtis steer S.W. by W. $\frac{1}{2}$ W. for the red light on Gatcombe Head until the shore of Facing Island is shut out by East Point. Then alter course and steer S.S.W., and open the bright light from Gatcombe Head before reaching Settlement Point. Keep Oyster Rock light a point on the starboard bow, pass one cable southward of the rock, and when the lights are in line, or Gatcombe Head light changes to red, steer into the main channel, the vessel then being westward of the Junction buoy.

The harbour light on the West side of the pilot's dwelling, is obscured when bearing eastward of E. by S. $\frac{3}{4}$ S. On opening out the light, steer towards Auckland Point; by keeping the light in sight, West Banks and the shoal ground off South Trees Point will be avoided. A small light at the foot of Auckland Point shows *bright* northward of E. $\frac{3}{4}$ S., and *red* over the black buoy off Auckland Point reef. Vessels will be clear of South Trees Point and the banks to the eastward, also of Barney Point and the outlying shoal ground, while the light is in sight.

The South Shore, which trends West 2 miles from the creek on the West side of South Trees Point to Gladstone, is low, with shoal water fronting it. The mouth of the creek on the West side of the point may be neared to a quarter of a mile: but between the creek and the town the shoal stretches out three-quarters of a mile to the north-westward of the creek; the outer edge, in 3 fathoms, then runs parallel with the shore to Barney Point.

Gladstone, a small township, and the chief settlement of Port Curtis, is situated on the South shore of the harbour, at about $2\frac{1}{2}$ miles to the westward of South Trees Point; it had a population of 1,633 in 1881. *Barney Point*, which juts out from the town, is bold and may be approached to a quarter of a mile. A jetty is being constructed into a depth of 25 ft. at low water. At nearly 2 miles to the southward of the town is *Round Hill*, 500 ft. high, one of the marks for entering Port Curtis.

A range of barren, rocky hills, apparently of granitic formation, extends from Rodd Bay, upwards of 60 miles, in a W.N.W. direction. *Mount Larcom*, the most remarkable of these hills, in lat. 23° 48′ S., long. 151° 6′ E., is 2,060 ft. high, and is an excellent mark for making Port Curtis.

In making Port Curtis, either from the northward or southward, Mount Larcom may, as a general rule, be first steered for until the adjacent hills

are clearly made out. Some brief directions in connection with the light on Gatcombe Head have been given previously.

A vessel from the southward, entering by the South Channel, should, after passing the rocks off Bustard Head, bring Mount Larcom in line with Gatcombe Head, bearing W. $\frac{3}{4}$ N., and steer for them so until Peaked Hill (a remarkable mountain, 2,430 feet high, 16 miles south-westward of Rodd Bay) comes over the highest of the Seal Rocks, S. by W. $\frac{1}{2}$ W.; then steer S.W. $\frac{1}{2}$ S. $2\frac{3}{4}$ miles (making due allowance for the strength of the stream) or until Mount Larcom is about a quarter of a point open to the northward of Round Hill, the latter bearing W. by N., when a vessel would be about a mile W.N.W. of the highest of the Seal Rocks; from whence a N.W. by W $\frac{3}{4}$ W. course will, by keeping South Trees Point well open westward of Gatcombe Head, lead directly into the harbour, passing half a mile southward of Gatcombe Head.

A secure anchorage may be chosen, if necessary, off Observation Point; the nearer the shore, with safety, the better, as the tide stream runs from $1\frac{1}{2}$ to 2 knots, at one-third of a mile off. Vessels generally select this as a fairway anchorage when waiting for a wind to proceed to sea; and those of the largest size may safely go up, and anchor in 6 fathoms, in the stream, between Barney and Auckland Points. The anchorage between South Trees Point and Auckland Creek was found to be well sheltered from S.E. gales by H.M.S. *Alert*, 1881.

In entering the South Channel from the northward, a vessel should make for Hummock Hill, keeping it on a South bearing, and taking care not to bring it to the eastward of S. $\frac{1}{2}$ E., in order that the eastern edge of East Banks may be cleared. When Seal Rocks are distinctly made out, approach them on their northern side (which is steep-to) until Mount Larcom is about a quarter of a point open to the northward of Round Hill, W. by N.; then proceed up the harbour, as before directed.

Vessels from the northward, entering Port Curtis by the North Channel, should, when the land is clearly recognized, bring the extreme of Gatcombe Head to bear S.W. by W., when it will be in line with Settlement Point; and should be kept so until the eastern coast of Facing Island is shut in by East Point; a vessel will then be clear of the N.W. end of the East Banks and of the shoal water off East Point, and may round the S.E. end of Facing Island. Keep about a quarter of a mile outside Settlement Point and Oyster Rock off Gatcombe Head, taking care to steer clear of the $3\frac{1}{2}$-fathoms knoll off the head. A berth may then be taken up as before directed.

It is high water in Port Curtis, on full and change, at $9^h\ 30^m$; springs rise from 10 to 12 feet. The tides here seem to be as much affected by the prevailing winds, as they are, by all accounts, at Moreton Bay, and the streams set very strong in the channels.

HERVEY BAY, on the western side of Sandy Cape, is about 80 miles broad E. by S. and W. by N., and 50 miles deep. Its eastern shore is formed by that

part of the coast of Great Sandy Island, extending from the cape to Sandy Point. The western shore, consisting of rocky points and sandy bays, extends in a north-westerly direction 35 miles from Dayman Point, in the bight of the bay, to Sloping Hummock, a hill near a projecting part of the coast; thence the low western shore of the bay still continues to trend north-westward 50 miles to Round Hill Head, 10 miles S.E. ½ E. from Bustard Head lighthouse.

Burnett River, entering the western side of Hervey Bay, 5 miles N.N.W. of Sloping Hummock, has, at low water, 6 ft. water over its bar, which is marked by a buoy. Strangers should not attempt to enter without a pilot, and when coming from the northward must not approach the coast nearer than 3 miles, to avoid the banks, and attend to the lead till the South head light bears W.S.W., when they may steer for it.

Bundaberg, a township of 1,192 inhabitants in 1881, is situated on the South bank of the Burnett River, 9 miles from its mouth, and can be reached by vessels of 500 tons. It is the outlet for a considerable extent of country, and for the Mount Perry mines. Sugar is largely grown, and coal exists in the locality. There is a railway to Gillen's Siding, 44 miles inland.

Lights.—On the South head of Burnett River is a white lighthouse, showing a *fixed bright* light between N.W. by W. and S.E. by E., elevated 33 ft. and visible 10 miles. Two leading lights are also shown from beacons on the South head, for crossing the bar.

Hervey Bay must be cautiously navigated, especially in the bight, where sandy shoals, with as little as 3 fathoms water upon some of them, extend 10 miles to the northward from the North entrance of Great Sandy Island Strait.

SANDY CAPE, the North extreme of Great Sandy Island, is a prominent headland and a remarkable feature of this coast, affording, with its lighthouse, by day and night, an excellent mark for vessels passing by the Inner Route for Torres Strait, the navigation of which may be said to commence on rounding Breaksea Spit, a shoal extending 17 miles from the cape. The cape is a low, rounding, sandy point, with ranges of irregular sand-hills, scantily covered with vegetation, stretching into the interior of the island, which from their white and cliff-like appearance can be seen fully 24 miles to seaward.

The **LIGHTHOUSE**, an iron tower, painted white, and 99 ft. high, stands on the highest hill, 280 ft. high. It shows a *revolving bright* light every two minutes, elevated 400 ft., and to be seen 27 miles off. The period of revolution of the light is the same as that of the Bustard Head flashing light, and this should be remembered.

To vessels from the southward the light will become visible as soon as it is opened out clear of Indian Head, bearing N.W. ¾ N., and will show over Hervey Bay until it is again intercepted by the hills to the S.S.W. of the lighthouse, and will be visible to within 4 or 5 miles northward of the Fairway buoy of Ship Channel.

Sandy Cape Shoal is a detached coralline knoll of 9 ft., lying 2½ miles east-

ward of the eastern elbow of Breaksea Spit; from it the lighthouse bears S.W. by S. ¼ S., distant 10½ miles.

This danger lies directly in the track of vessels rounding Breaksea Spit; to pass inside, it is recommended to borrow on the breakers of the spit to within 8 or 10 fathoms; or to ensure passing outside by night, the soundings should not be decreased to less than 35 fathoms. Except in case of absolute necessity, vessels should pass eastward of the shoal.

BREAKSEA SPIT is a dangerous shoal on which the sea generally breaks heavily, extending N. by W. 19 miles from Sandy Cape lighthouse; the greater portion consists of coral and sand-banks, with some narrow, intricate channels between them. The spit should not be approached to the southward of lat. 24° 22′ S.

The East side of the spit is steep-to, there being from 4 to 9 fathoms at the distance of 1 mile from the edge of the breakers. The western side should be approached with great caution, as its edge is not minutely defined, and the soundings are irregular.

By day the sand-hills at Sandy Cape should be dipped below the horizon before rounding Breaksea Spit, while at night a vessel should not be kept away for rounding its northern extremity until the light begins to dip below the horizon. This position of the light should be retained until the necessary change of bearing shows that the danger is passed.

In rainy or squally weather, when the light on Sandy Cape may be obscured, vessels should not attempt to make the light from the northward, but should endeavour to pick it up when bearing to the eastward of S.E., or to the westward of S.W.

A good departure can be obtained for vessels taking the Capricorn Channel by observing the bearing of the light when it begins to dip below the horizon.

Good anchorage will be found when the wind is from E.N.E. to South, with the lighthouse bearing E.S.E., at from one-third of a mile to 1 mile from the beach, in from 4 to 6 fathoms, sand, but good holding ground.

Vessels intending to anchor under the cape should not bring the lighthouse to bear to the southward of S.E., or when off Rooney Point, to the northward of E.N.E. Vessels, however, when not drawing more than 10 ft., may, in smooth water, cross Ferguson Spit, which extends to the N.N.W. from North-West or Rooney Point, with the light bearing N.E. by E.; while the lighthouse in line with a white patch bearing E.N.E. leads clear of the extremity of the spit in 10 fathoms water.

Water can always be obtained at the back of the beach, on the western side of the Lighthouse Hill.

GREAT SANDY STRAIT separates Great Sandy Island from the mainland. It is 40 miles long, and from 1½ to 8 miles wide, the eastern shore of the strait being formed by the southern portion of the western coast of the island, from Sandy to Hook Point. The northern entrance of this strait lies between Day-

man and Sandy Points, and is considerably broader than the southern entrance; and, although much of it is occupied by shoals, some of which dry at low water, there is a good channel for large vessels, up to the white cliffs off the entrance of Mary River.

Wood and *water* are abundant; the most convenient watering places are at the South end of Great Sandy Island, nearly abreast of Stewart Island, and at the white cliffs off Mary River.

From Sandy Point the *East shore* of the strait takes a winding and general S. by E. direction, 25 miles, to Stewart Island, between which and Snout Point the coast is low, irregular, and broken, consisting of narrow sand, mud, and mangrove flats, with some white cliffs about midway. From Snout Point, the coast, low and wooded, trends $3\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S. to Elbow Point, and then south-eastward and eastward, 4 miles, to Hook Point, on which are the beacons hereafter described.

From Dayman Point the *West shore* of the strait trends 9 miles southward to Mary River, 3 miles westward of which the low mangrove coast turns sharply to the southward for 22 miles, nearly parallel with the opposite shore.

The entrance of Great Sandy Strait from Hervey Bay may be said to commence at a line extending from Arch Cliff, on Great Sandy, or (as it is locally named) Fraser Island, W. by S. $\frac{1}{2}$ S. 28 miles to Burrum Point of the mainland, the depth across varying from 9 to 5 fathoms, sand over mud. No ship should go within 2 miles of this line without a pilot, the whole space to Woody Island being full of sand-banks, with shallow water and blind channels between them, into which a vessel might run and find herself surrounded by breakers.

Both the mainland and Great Sandy Island being thickly wooded, and without any decided feature, makes it difficult to fix a vessel's position by compass bearings, the white Arch Cliff on Great Sandy Island, and Woody Island to the southward, being the only conspicuous objects, and even Woody Island and its lighthouses are not very plainly seen until near the Fairway buoy.

Vernon Point is a prominent projection of the mainland on the West side of the North entrance of Great Sandy Island Strait; but it does not appear like a point when approaching it from the northward, until well into the channel between the banks, the point bearing W. by S.

From Vernon Point the coast, which forms a bight, trends E.S.E. 5 miles to Dayman Point; it is thickly wooded, and is bordered by a sandy beach, off which the water is very shallow.

From the white Arch Cliff on Great Sandy Island the coast trends S.W. by W. 10 miles to Sandy Point; the intermediate shore consists of a continuous sandy beach.

Woody Island, of which the N.W. point lies E.N.E. 2 miles from Dayman Point, is $4\frac{3}{4}$ miles long, N.W. and S.E., and 1 mile broad near the centre, where it rises to the height of 200 ft. above high water.

Lights.—The *North Bluff* light on Woody Island is *fixed bright*, excepting

between N.E. ¾ E. and E. ½ N., where it is *red*; it is elevated 130 ft., and visible 16 miles.

The *Middle Bluff* light is *fixed bright*, excepting to the northward between N.E. by N. ¾ N. and N. ¼ W., where it is *red*, and is obscured between S.E. by S. ¾ S. and S. by E. ¼ E. It is elevated 215 ft., and visible 19 miles. A 5° sector of *green* light is shown to E. by N. over an 8-ft. swashway through Middle Bank.

Both lighthouses are hexagonal-shaped, white, and 34 ft. high, 2 miles apart S.E. ½ E. and N.W. ½ W.; the northern is placed four-tenths of a mile from the North extreme of the island; the southern is placed on the summit of the island abreast Middle Bluff. They will enable a vessel to enter the port of Maryborough through the West channel at night. The lighthouses are connected with Maryborough by electric telegraph.

The Ship Channel, which leads south-eastward between Woody Island and Sandy Point, is bounded to the eastward by Fork and Sandy Point Banks, and Little Woody Island; and to the westward by Pearl, Middle, and Long Middle Banks. The channel is marked by black buoys to the eastward and red buoys to the westward. From just within the Fairway buoy the least depth of water in the Ship Channel is 18 ft. There is no navigable channel on the West side of Woody Island. A pilot-vessel is stationed at the North entrance of the strait.

The space from Dayman Point and Woody Island to Mary River forms an extensive bank of muddy sand, which dries at low water, and has several patches of mangroves on the middle of it.

It is high water at Mary River heads, on full and change, at $9^h\ 30^m$; rise 8 to 10 ft. The flood stream through Great Sandy Island Strait from the southward meets that from Hervey Bay to the northward, near Round Bush. Springs run from 3 to 4 knots, the tides being generally very irregular.

The *Outer Banks*, in fine weather, may be distinctly seen by the colour of the water, and in bad weather by the breakers on them. They are very dangerous, and lives are frequently lost from boats' crews of vessels wrecked on or near Breaksea Spit, when running for Maryborough, and during the night finding themselves among the breakers.

A vessel bound to Maryborough, having entered Hervey Bay with a fair wind, should not approach the entrance of Great Sandy Strait nearer than into 10 fathoms during the night, as in 6 fathoms she will be within 1 mile of the breakers. Having shoaled to 10 fathoms, a vessel should anchor, and wait for daylight; the bottom is sandy, with mud underneath.

No vessel, until her position is clearly ascertained, should shoal to less than 9 fathoms when standing towards the outer banks. When Woody Island is distinguished, bring the two hummocks on the island just touching, keeping the higher one to the eastward, which will lead near to the *Fairway buoy*, which is *black* with a black flag. From the buoy, steer S.E. by E. ½ E., and leave a *red* buoy, on a 15-ft. patch, on the starboard hand, and a *black* buoy,

off the elbow of Fork Bank, on the port hand. Immediately the black buoy is passed, bring Leading Hill (a small peak, formed by a clump of trees, on the high land of Great Sandy Island) open West of Little Woody Island, and continue on this mark, passing a *red* buoy off the East extreme of Middle Bank, until Dayman Point is about two points open of the North point of Woody Island, when, making due allowance for the tide, steer E.S.E., northward of the *red* buoy on the extreme of Long Middle Bank; thence proceed with Leading Hill just open East of Little Woody Island until the high lighthouse bears S.W., then haul up and pass half a mile westward of Little Woody Island.

From abreast Little Woody Island, steer to pass within a quarter of a mile of the easternmost Duck Islet, and keep Little Woody Island open of Duck Islets until a red beacon is passed on the starboard hand. When Baupal Mountain is seen over a dip in the trees on the South head of Mary River, steer on this mark until the North head bears W.S.W., and a red buoy and beacon have been left to the northward, when pass northward of the midway buoy, and proceed into Mary River, or for the anchorage in Tyroom Roads.

Allowance must be made for the tide streams; but as the islands, buoys, and beacons are easily seen in daylight, there is little difficulty in entering the strait with a fair wind. Great caution, however, must be observed during the rainy season, from December till May.

By night.—When entering Hervey Bay, steer so as to pass 1 or 2 miles West of the Fairway buoy, until the two lights on Woody Island are visible and are brought in line, bearing S.E. $\frac{1}{2}$ E.; steer with the two lights in one past Dayman Spit and the Middle Bank, until the lights are nearly on the same level, then look out for the red buoy, which is placed a short distance to the S.W. of the line of the lights; on sighting the *red* buoy, steer about E. $\frac{3}{4}$ S. (making due allowance for the tide) for the red buoy off the North end of Long Middle Bank. Should the low or North light be the first to appear red, keep upon the edge of the red light until the high light also is red; but if the high light is the first to appear red, steer South until the lower light is also red.

When the lights are seen to become red at the same time, a vessel is about one-third the distance from Long Middle Bank across the channel; then steer about S.E. $\frac{1}{4}$ E., and open the bright lights, when, if the lower light shows as a bright light first, the vessel will be to the westward of the course, and to the eastward if the upper light becomes bright first. From thence steer to pass Little Woody and Duck Islands, keeping Little Woody Island open of the latter until the high light is obscured, when the vessel will be abreast the red beacon; she may then steer S.W. by S. $\frac{3}{4}$ S. until the light again opens out as a bright light, when she will be abreast the red buoy opposite the white cliffs, from which a course must be gradually shaped for the river heads.

In entering with the two lights in line, should the red buoy, which denotes

the turning point, by any accident not be seen, the vessel may still with safety stand on with the lights in line until the high light is dipped below the northern hill.

MARY RIVER—The entrance of Mary River lies 6½ miles S.S.W. of the South point of Woody Island, and South, 9 miles from Dayman Point, the low intermediate coast being lined with mangroves and fronted by an extensive mud-flat. It is best reached from Hervey Bay, and not from Wide Bay, as has often been tried by mistake.

Maryborough, proclaimed in 1861, is 15 miles above the mouth of the *Mary River*, and can be reached by vessels drawing 16 ft. It is the principal town in the district, and the port of shipment for the greater portion of the produce of the Burnett and Wide Bay districts. It contained a population of 10,500 in 1881. The river is being improved by dredging. A railway extends to Gympie, 61 miles to the southward.

Off the white cliffs opposite Mary River is *Tyroom Road*, affording good anchorage in 5 to 11 fathoms, sand. Wood and water may be obtained here. At the Quarantine Station, near the white cliffs, two *leading lights* are shown, which in line astern N.E. by E. ½ E. lead northward of Middle Bank buoy, and to Mary River entrance.

The South entrance of Great Sandy Island Strait is navigable from side to side, with from 10 fathoms between the heads to 7 fathoms 7 miles up, in a N.W. direction. Farther progress is then impeded by sand and mud-flats, after which a narrow and intricate channel trends to the northward, along the East shore, to abreast of the entrance of Mary River, passing between the western side of Great Sandy Island and extensive shoals, with numerous mangrove islands on them, stretching nearly across from the West side of the strait to the island.

WIDE BAY is about 10 miles across from Double Island Point to the S.E. bend of Great Sandy Island, and from 3 to 4 miles in depth. Being exposed to seaward, the bay affords no sheltered anchorage in gales from that direction.

Wide Bay Harbour is difficult of access on account of a bar across the entrance, at about 2⅓ miles from the shore. The entrance, which is 10 miles north-westward of Double Island Point, is a deep channel a little more than half a mile wide, between two dangerous spits extending eastward of Inskip and Hook Points (the latter, a pilot station, being the South extreme of Great Sandy Island). Strangers require a pilot, as the channels frequently shift.

The Bar has from 2 to 2¾ fathoms water on it, and is in general easily distinguished by heavy breakers, or in calm weather, when the sea is smooth, by the green colour of the water. With strong S.E. or easterly winds the sea breaks heavily upon the bar, rendering it unsafe to cross.

Cross the bar in not less than 15 ft. at low water, with the white and black square beacons on Hook Point in line, and pass southward of the red buoy about half a mile East of Hook Point. Two square white beacons on Inskip

Point in line S.W. ½ W. lead clear of the spit off Hook Point, and a mid-channel course should be steered until the beacons on the West part of Inskip Point are brought in line astern bearing S.E. ⅓ E. which lead to the Fairway buoy off Snout Point, when, if dark, anchor till daylight. *Leading lights* are shown on the beacons at night.

Inside, the harbour branches off into two arms, one trending to the southward, behind South Sandy Island, and Great Sandy Strait trending to the northward. When once inside, secure anchorage may be found for a large number of vessels, in from 4 to 10 fathoms, and it is one of the most commodious and sheltered ports on this part of the coast.

In leaving Wide Bay a vessel should not attempt to proceed to sea if there is any break across the bar, as it is attended with great risk and danger, from the high rollers which break heavily upon the bar.

A stranger, after entering Wide Bay Harbour, should procure the assistance of a pilot or one of the natives of Great Sandy Island, some of whom are very intelligent, and have a good knowledge of Great Sandy Island Strait; they will readily come on board, and will be found very useful.

Bribie Island, which forms the western side of the N.W. entrance of Moreton Bay, is of moderate elevation, about 18 miles long, N. by W. ½ W. and S. by E. ½ E., and from 3 to 4 miles broad. It is separated from the main land by Pumice-stone Strait, nearly filled up by mangrove islets and muddy flats.

A large *beacon* is placed on the beach of Bribie Island, at 5 miles South of Caloundra Head, as a mark for the entrance of the N.W. Channel. The northern half of the beacon is painted white, and the southern half black.

The Glass Houses are three peaks near each other, rising abruptly from an extensive low plain, and remarkable for their singular resemblance to glass furnaces. *Burwa*, the northernmost and highest, 1,760 ft., is visible from a distance of 45 to 60 miles. They bear W.N.W. distant respectively 17, 19, and 20½ miles, from Skirmish Point, the S.E. extreme of Bribie Island.

Cape Moreton, the North extreme of the island of the same name, is 67½ miles S.S.E. from Double Island Point, the southern limit of Wide Bay, the coast between being generally low.

MORETON ISLAND is 20 miles in extreme length, about North and South, and 5 miles broad, near the North end. Portions of it are of considerable elevation—*Mount Tempest*, near the centre of the island, being 910 ft. above the level of the sea. The eastern shore of Moreton Island, from Cape Moreton, its N.E. point, trends S. ¼ E. nearly in a straight line of sandy beach, about 19 miles, to the S.E. point of the island.

CAPE MORETON, on the summit of which is a light-tower of white stone, 70 ft. high, is in lat. 27° 2′ 10″ S., long. 153° 29′ 0″ E., and when seen from the southward, appears to be detached, as the land between it and the higher parts of the island is low.

The Lighthouse on Cape Moreton exhibits a *bright* light, *revolving* every minute, showing a bright face lasting 15 seconds, followed by an eclipse of 45 seconds duration, elevated 382 ft., and visible 26 miles.

A vessel from the southward requiring a pilot, should haul up round the North point of Moreton Island, and keep a good look-out for the pilot-vessel, which cruizes off the lighthouse during the day, or for the boat, as the case may be; the arrival of any vessel requiring a pilot being telegraphed from the lighthouse to the pilot station on Comboyuro Point. Strangers should pay attention to any signal made at the lighthouse for their guidance, and should not enter without the assistance of a pilot when available.

North Point lies N.W. $\frac{3}{4}$ W. nearly 1 mile from Cape Moreton lighthouse, and has a small hillock upon it, which serves as one of the marks for entering Moreton Bay.

Yellow Patch Light, S.W. nearly half a mile from the North point, is *fixed*, elevated 49 ft., and visible 11 miles, shown from a white wooden tower, 43 ft. high, placed near the shore a little to the eastward of a small yellow patch; the light shows *bright* between W. $\frac{1}{4}$ S. and N.W. by W. $\frac{3}{4}$ W. to the fairway buoy; *red* thence to N.W. by W. $\frac{1}{8}$ W.; and thence *bright* to N. $\frac{1}{2}$ E. With the latter bright sector in sight it clears Flinders Rocks, Smith Rock, Hutchison Shoal, and North Banks; and in line with Cape Moreton light E. by S., easterly, it leads through the Middle Channel, with not less than 14 ft. at low water. It is shifted as changes take place.

Flinders Rocks, some of which are 5 ft. above water, and others dry at half tide, are about half a mile in circumference, and lie N.N.E. 3 miles from North Point.

Smith Rock, a dangerous rock, with only 7 ft. of water over it, lies in the fairway of the passage into Moreton Bay, between Cape Moreton and Flinders Rocks. A *black buoy*, with staff and *cage*, is moored in 10 fathoms, 3 cables S.S.W. of it. The rock, which is conical, and has 3 and 4 fathoms close-to, lies nearly midway between the outer extreme of Cape Moreton and Flinders Rocks, with the lighthouse bearing S. by W. $\frac{1}{2}$ W. distant 2 miles. By night, Cape Moreton light kept westward of S.W. by S. $\frac{1}{2}$ S., will ensure being seaward of this danger.

Hutchison Shoal, N. $\frac{1}{2}$ E. 2 miles from Flinders Rocks, and nearly $5\frac{1}{2}$ miles from Cape Moreton, though not having at present less than 22 ft. water on it, is dangerous to ships of great draught, and should be avoided by loaded coasters, on account of broken water, when the $1\frac{1}{2}$-knot E.S.E. current sets against a strong easterly wind. At night vessels are to the westward of this shoal while the Yellow Patch light is in sight.

MORETON BAY, through which the port of Brisbane is approached, is the extensive sheet of water separating Stradbroke and Moreton Islands from the mainland. It is 35 miles long North and South, and 13 miles broad. The greater portion of the bay is rendered unnavigable by shoals; those between

which the entrances lie being known as the North, East, and Venus Banks. The outer edges of North and East Banks may be easily seen from the sea breaking upon them. Anchorage may be found in almost any part of the bay, under shelter of the numerous shoals. The greatest caution is necessary in using the channels, as the buoys are liable to break adrift, and the tides set obliquely across the channels. Strangers should not attempt to enter without a pilot, as the channels are liable to change.

North Banks.—The East extreme of these banks, with $2\frac{1}{4}$ to $3\frac{3}{4}$ fathoms on it, lies N.W. by N. $\frac{3}{4}$ N. $6\frac{1}{2}$ miles, and their South extreme N.W. $\frac{1}{8}$ N. $5\frac{1}{4}$ miles from Comboyuro Point, the N.W. extreme of Moreton Island.

The Ship or Main Channel into Moreton Bay, was bounded to the north-westward by North Banks, and to the southward by East Banks. In 1879 it was announced to be closed to navigation, through the extension of the banks. The buoys have been removed.

North-West Channel.—Since the closing of the Ship or Main Channel, the N.W. Channel, southward of Caloundra Head, is now the deepest of the entrances into Moreton Bay.

Freeman Channel, between Venus Bank and Moreton Island, is only fit for coasters and steamers of not more than 9 ft. draught.

Comboyuro Point, the N.W. extreme of Moreton Island, is a low, steep-to, sandy point, S.W. by W. $\frac{1}{4}$ W. 5 miles from Yellow Patch lighthouse.

The Lighthouse on Comboyuro Point shows a *fixed red* light eastward, from N. by E. $\frac{1}{4}$ E. towards the land, and being kept in sight will clear the East Banks to the eastward. This light is obscured between the bearings N. by E. $\frac{1}{4}$ E. and N. by W. $\frac{1}{2}$ W. over Venus Banks and East Banks, when it again shows out as a *bright fixed* light to the northward between N. by W. $\frac{1}{2}$ W. and W.S.W.; thence it is obscured over Yule Road between W.S.W. and S. $\frac{1}{2}$ W., and visible, *bright*, between S. $\frac{1}{2}$ W. and S. by E. It is visible about 9 miles.

The Pilot Station is a mile South of Comboyuro Point, and has telegraphic communication with Cape Moreton lighthouse and Brisbane.

Yule Road is a slight indentation of the steep sandy beach westward of Comboyuro Point, and affords anchorage in 5 to 8 fathoms, sand, at a half to three-quarters of a mile from the shore. Whalers and other vessels would find Yule Road the most convenient place for taking on board either water or wood. The watering places are situated 2 miles southward of Comboyuro Point.

Yule Bank, which bounds Yule Road to the south-westward, has $3\frac{3}{4}$ fathoms to 9 ft., and perhaps less, water on it. A *red buoy*, moored in $3\frac{1}{4}$ fathoms, marks the East extreme of the spit, between which and Moreton Island the channel is about 1 mile wide.

Cowan-Cowan Point Light.—A *fixed* light is shewn at about 56 ft. above high water from Cowan-Cowan Point, which is S. by E. $4\frac{1}{4}$ miles from Com-

boyuro Point, on the West side of Moreton Island. In entering Moreton Bay this light will be visible, *bright*, when bearing between S. by E. ½ E. and E. ¾ N.; obscured between E. ¾ N. and N.E. ½ N., or in the direction of the central and S.W. banks; *bright* between N.E. ½ N. and N.N.E., or in the main channel between the S.W. and Middle Banks; obscured between N.N.E. and N. by E. ½ E., or in the direction of the Middle Banks; and visible over East Channel as a *red* light from N. by E. ½ E. to about North, eastward of which, towards the West shore of Moreton Island, it is obscured.

North-West Channel Directions.—Vessels about to enter this channel by the opening between Hamilton Patches and the North end of North Banks, should bring the Peak of Burwah, open to the North of Tibrogargan (the peak which resembles a broken shaft) about the width of the former, and keep these marks on until the eastern shoulder of the range, 600 ft. high, just North of Malula River, is open of Caloundra Head. Then steer with the S.E. peak of the Glasshouse Mountains, 920 ft. high, in line with the black and white beacon on the beach of Bribie Island, bearing S.W. by W. As the passage is entered, the northern edge of North Banks, which is steep-to, will be clearly seen, having 7 fathoms close alongside.

When Coolum Hill is shut in, its own width, with Caloundra Head,—its top showing over the near land,—a vessel may haul up and bring the right shoulder of Malula range in line with the foot of the western slope of the hills forming Caloundra Head. A course S.E. ¾ S. should then be steered, keeping these marks on until Cowan-Cowan lighthouse is brought in line with Leading Hill on a S.E. ⅔ E. bearing. The hill should be kept slightly open to the S.W. of the lighthouse until the *black* buoy off Spitfire Banks is passed. The positions of the hill and lighthouse should then be reversed until after passing the *red* buoy off the North extreme of Western Banks, when the hill can again be brought to the S.W. of the lighthouse, and the main channel past Cowan-Cowan Point entered.

By following the above directions a depth of not less than 6 fathoms at low water will be carried to the anchorage in Brisbane Roads.

Vessels taking the passage between Caloundra Head and the 3-fathoms bank, will carry the deepest water by keeping at a distance of from half to three-quarters of a mile from the shore of Bribie Island.—*Commander G. P. Heath, Portmaster*, 1879.

Middle Channel Directions.—Vessels not drawing more than 15 ft. entering Moreton Bay during the night through the Middle Channel, by keeping Cape Moreton light open slightly northward* of Yellow Patch light, and hauling up to the southward on the opening out of the Comboyuro Point light, will open out the light on Cowan-Cowan Point, when they are well clear of the western

* The former directions recommended the lights to be kept in one, but the Venus Bank Spit having extended northward, the above directions were issued in 1882.

edge of Venus Bank, and by keeping this light open they will not approach too closely to any portion of that bank. When the Yellow Patch light is shut out, they should haul up S. by E. ½ E.; the Comboyuro Point light is obscured on an E.N.E. bearing, and again opens out when bearing N. ½ E. After opening out Comboyuro Point light on this bearing, vessels will, by keeping this light in sight, be to the westward of the shoal water northward of Cowan-Cowan Point, and to the eastward of Yule Bank in Yule Road, and of those portions of the S.W. Banks on which there is less than 15 feet at low water.

The light on Cowan-Cowan Point will be obscured when it bears E. ¾ N., and will open out at N.E. ½ N., remaining visible between that bearing and N.N.E. While the light on Cowan-Cowan Point is kept in sight between these bearings, a vessel will be clear of the S.W. Banks on her starboard side, and the Middle on her port hand, being in not less than 3 fathoms on either side of the channel. Vessels in working to the S.W. may stand across to the eastward from the line of eclipsed light off the S.E. edge of the S.W. Banks, until the light again opens out of the line to the eastward of the Middle Banks. Soon after dipping Cowan-Cowan light the lightvessel at Brisbane Bar will be visible above the horizon.

Vessels arriving in the port at night, and wishing to anchor on the 6-fathoms bank in Yule Road, should, while keeping in sight the light on Cowan-Cowan Point, anchor as soon as convenient after opening out the Comboyuro Point light on that bearing.

Howe Channel, with 3¾ to 4 fathoms water, often used in fine weather, has an entrance 3 cables wide, with a floating *bell beacon* in it, moored with Cape Moreton lighthouse bearing E. by S. ½ S., and Comboyuro lighthouse S. by E. ¼ E. Vessels entering by Howe Channel, should pass northward and westward of the beacon, rounding it close-to, and bring the centre of Ship Patch in line with Cowan-Cowan lighthouse, bearing S. by E., until Cape Moreton lighthouse is in line with Yellow Patch lighthouse, when the whole of Ship Patch should be opened westward of the lighthouse on Cowan-Cowan Point, to clear Venus Bank.—*Commander G. P. Heath.*

Vessels from the northward, entering Howe Channel by night, should, after making Comboyuro Point *bright* light, be careful not to enter the *red* sector of Yellow Patch light, until Comboyuro Point light is obscured on a S. by E. ½ E. bearing. On the latter light being obscured haul gradually to the southward, enter the *red* sector of Yellow Patch light, and on opening out Comboyuro Point light, steer for it, keeping on the edge of the *bright* light. When Yellow Patch light comes nearly in line with Cape Moreton light, edge to the westward and open out the *bright* light on Cowan-Cowan Point, which, bearing S. by E. ¼ E., leads westward of Venus Bank and eastward of Hixson Bank. Attention to these directions will take a vessel through in not

less than 16 ft. at low water; by similarly keeping the eastern edge of Cowan-Cowan Point light just open, the least water will be 19 ft.

Good anchorage in Yule Road, will be found on the 6-fathoms bank abreast the pilot station, when Ship Patch is just open West of Cowan-Cowan Point.

BRISBANE RIVER, which enters Moreton Bay on its western side, at 15 miles south-westward of Cowan-Cowan Point, had a shallow bar, with only 4 feet water on it; through this, however, a channel has been dredged, 200 feet wide, with a depth of 15 ft. at low water, but the cuttings across the inner bar and Pelican Bank, which are not yet deepened (1883), have only 10½ ft. at low water. To the East of it are *Mud* and *St. Helena Islands*, both low. The *Roadstead*, which extends from *Woody Point*, 6 miles N.N.W. of the bar, to St. Helena and Mud Islands, is exposed to N.E. gales, there being no nearer protection from that quarter than Moreton Island, distant 12 miles; the sand-banks to the northward afford some shelter from the northerly, and Mud and St. Helena Islands from easterly and S.E. gales. A *fixed bright* fishing light, elevated 85 feet, is shown on the S.E. part of St. Helena Island.

A Lightvessel, painted red, with a *fixed bright* light, elevated 34 ft., and visible 10 miles off, lies in 3 fathoms on the outer edge of Brisbane Bar, and half a cable eastward of the line of the new cutting. She shows the height of the tide on the bar and in the cutting, by day and night, by a system of signals.

Abreast the West Beacon, nearly 2½ miles S. ¾ E. from the lightvessel, the channel is a cable wide, and on its eastern side are three black beacons placed triangularly about a cable's length apart. The westernmost one shows white to seaward, and from the other two, *lights* are shown at night, which kept bearing N.N.E. lead through the cutting over the inner bar to the southward of them. Between them and Brisbane several other pairs of beacons are established, from which leading lights are shown at night.

The direction of the line of the new cutting is indicated by two white lighthouses on *Fisherman Islands*, on the East side of the channel, 1,433 yards apart, N. by W. ¼ W. and S. by E. ¼ E. The North light, elevated 27 ft., is *fixed red*, and shows through a sector of 10° in the line of the cutting. The southern light, elevated 47 ft., is *bright*, and is seen when bearing between S.E. by S. and N.E. by N. ½ N., also between W. ¾ N. and N.W. ½ N. where not obscured by trees. In line bearing S. by E. ¼ E. they lead through the cutting at a distance of 50 ft. from its eastern edge.

With the *bright* light bearing S.W. by S. ½ S. vessels will be clear of the shoal water off Mud Island, and should steer to pass well to northward and westward of the bar lightvessel, entering the cutting with the high light, *bright*, just open westward of the low light, *red*, and keeping it in that position till the leading lights for the cutting over the inner bar come in line.

On the opening of the new cutting to navigation, in May, 1883, the lights and buoys in West or Frances Channel were removed. The channel is marked by beacons.

There is an *electric telegraph* station at Lytton, at the entrance of the river, in communication with Brisbane.

Brisbane River being intricate, and the lower portion full of shoals, a pilot is absolutely necessary, even for coasting vessels.

BRISBANE, the metropolis of the colony of Queensland, is situated about 13 miles above the mouth of the Brisbane River. Its population in 1883 was estimated at 36,169. There is ample wharf accommodation, but owing to the bar at the mouth of the river vessels drawing more than 16 feet of water, cannot come up to the city. A fine iron swing-bridge connects North and South Brisbane. There is a dry dock, 300 feet long, at South Brisbane, with a depth of not less than 20 ft. over the sill. *Ipswich*, the second town of the colony, is situated at the head of the navigation of the river, 25 miles West of Brisbane; the Southern and Western Railway connects it with Brisbane. The railway extends to Mitchell, 369 miles westward of Brisbane, and to Stanthorpe, 207 miles to the southward. A railway, 12 miles long, connects Brisbane with *Sandgate*, 5 miles westward of the river entrance.

Tides.—It is high water at Comboyuro Point in Moreton Bay, on full and change, at $9^h\ 30^m$; the rise is from 3 to 7 ft.; strong south-easterly winds cause the greatest rise; but during the prevalence of westerly winds in the winter, it is at times scarcely perceptible. In the South passage to the Main Channel into Moreton Bay the flood sets West at the rate of between 1 and 2 knots. The general set of the flood in the bay is to the South, and the ebb to the North; but in some places the direction of the stream is varied by the shoals.

On Brisbane Bar it is high water, on full and change, at $10^h\ 5^m$; springs rise 7 ft., neaps 5½ ft. The streams in the channel run from 1½ to 2½ knots.

ROUS CHANNEL, leading into Moreton Bay to the southward of Moreton Island, between Amity and Sandy Points, is nearly 1 mile wide, with from 5 to 10 fathoms between; but North and South Banks and the bar, between 2 and 3 miles off the entrance, are so exposed to the ocean rollers, that it is generally considered a dangerous channel. This channel is chiefly available for coasting steamers during daylight, when there is not a heavy swell setting in on the coast. It is not recommended for sailing vessels, except in fine weather. On Sandy Point, the South extreme of Moreton Island, is a signal and telegraph station.

Two *black* beacons, the inner and higher of which is surmounted by a red ball, are placed on the South extreme point of Moreton Island. No permanent directions can be given, as the depth and position of the channel vary very considerably at different times. Thus, in February, 1870, the least depth was 13 feet, in the June succeeding it was not more than 11 feet. Local knowledge, or a pilot, is necessary.

NEW SOUTH WALES.

The coast of New South Wales commences on the northern side of Point Danger, in lat. 28° 9′ S., and thence extends a distance of 800 miles to Cape Howe. It has recently been re-surveyed by Captain Sydney, Lieut. Gowland, and others.

Tweed River, just southward of Danger Point, has a *fixed bright* light, visible 14 miles, shown at its pilot station on Fingal Head; when bearing between S.W. ½ W. and W.S.W. the light is obscured by Cook Island. *Richmond River*, also only accessible to small coasting vessels, has two *fixed bright* lights W.N.W. and E.S.E., 50 yards apart, and visible 7 miles, shown from near the pilot station, which is in lat. 28° 51′ 30″ S., long. 153° 35′ 55″ E.

Richmond River would be navigable for ocean-going vessels for distances of 90 and 50 miles along the two arms into which this noble stream divides; but the trade is now confined to ships of light draught, by reason of the sand bar at the entrance. This is one of the richest but most recently settled districts of the colony, but population there is scarcely yet numerous enough to justify the Government in constructing a breakwater.

SHOAL BAY, which forms the entrance of Clarence River, is difficult to be found except by its latitude, the South head being in 29° 25′ 33″ S.; but Clarence Peak, 12 miles to the southward, serves as a mark when coming from that direction; and Saddle-back Mountain, 10 miles inland, which is visible at the distance of 15 or 20 miles, is a good guide from the eastward.

The pilots' look-out is at the signal station on the South head, where there is a flag-staff visible at the distance of 8 or 9 miles, and from which the usual coast signals will be made. A *fixed bright* light, visible 7 miles, is shown at night from the pilot station.

The bar has 10 to 13 feet on it at high water springs; but it shifts, and the depth on it varies. Two white beacons on North Spit, or the Peninsula, kept in line lead in mid-channel over the bar. These beacons will be shifted as the bar shifts. A breakwater is being constructed northward and eastward from South head.

Clarence River, which flows into Shoal Bay, is of considerable importance, it being the outlet for the produce of a large and rich agricultural and pastoral district. It is navigated by steamers not drawing over 9 ft. for a distance of 40 miles to *Grafton*. The river is being deepened by dredging. Provisions, wood, and water, are plentiful, and repairs can be effected.

Solitary Islands are detached clusters of islets and rocks scattered over a space of about 22 miles along the coast and 4 to 6 miles from the shore. They may be boldly approached from seaward, but only small vessels, with local knowledge, should use the passages between them and the coast.

Light.—On the summit of *South* Solitary Island, is a lighthouse, 40 feet

high, showing a *revolving bright* light every half minute, elevated 192 feet above high water, and visible 19 miles. Lat. 30° 11′ 50″ S., long. 153° 17′ 15″ E.

TRIAL BAY, situated on the N.W. side of Smoky Cape, affords good anchorage during southerly and S.E. winds.

Smoky Cape, in lat. 30° 52′ S., has three hummocks on as many projecting parts, and a narrow tongue of land recedes about 8 miles from the cape in a N.N.W. direction; the central hummock bears N. ¼ E. 31 miles from Port Macquarie, and is visible 36 miles. There are some rocks close off Smoky Cape, and a small shoal patch, with a rock above water, lies about 2⅛ miles to the southward of it.

Vessels approaching Trial Bay from the southward, with strong southerly winds, should pass about 2 cables eastward of Fish Rock, which lies about a mile S.E. of the southern bluff, and keep at about the same distance off until abreast of Laggers Point, the N.E. extreme of Smoky Cape. Then haul into the bay, and anchor in 7 to 12 fathoms, Laggers Point bearing E.N.E. and S.W. Rocks—in the S.W. corner of the bay—bearing S.W. Vessels may here lie sheltered from all southerly winds between E.S.E. and W.N.W., and obtain a supply of wood and water on the beach, between the easternmost hills on Smoky Cape.

M'Leay River is only capable of admitting small coasting vessels. The North, or Double Head of the river, on which is a signal station, bears N.W. 6¼ miles from Smoky Cape.

PORT MACQUARIE, the entrance of which is in lat. 31° 25′ S., long. 152° 54′ 15″ E., is the embouchure of Hastings River. It is a bar harbour, of dangerous access, on account of the banks of sand that project from Pelican Point, the low North sandy point of entrance, and on which the sea breaks and forms sand-rollers; they, however, serve to show the edge of the channel, which is about 90 yards wide. The coast from Tacking Point, 2¾ miles to S.S.E., takes a N.N.W. direction to Green Mound (a remarkable conical-shaped hillock), and from thence the South shore of the entrance trends nearly West to the narrow entrance opposite Pelican Point. A *fixed bright* light, visible 15 miles, is shown on Tacking Point.

From between Green Mound and the next projection to the westward, the *bar* stretches across towards the sand-rollers, and is about 120 yards in extent. The depth of water on the bar varies from 5 to 10 feet; but when there is only one channel, and that straight in and out, there is seldom less than 7 feet, at low water springs. There is good anchorage, with an off-shore or southerly wind, and smooth water, in 6 fathoms, hard sand, with the flagstaff bearing S.W. by W., and Bird Rock S.S.E.

There is a pilot to take vessels in and out over the bar; and vessels not requiring a pilot, will have the tidal, or other necessary signals made to them. Vessels can obtain supplies of provisions or water, in moderate weather, without entering the port.

Harrington Inlet, forming the estuary of *Manning River*, is only accessible to coasting vessels. On *Crowdy Head*, to the N.E. of the inlet, a *fixed bright* light is shown, visible 11 miles, but obscured over Mermaid Reef to the land; lat. 31° 51′ 10″ S., long. 152° 46′ E.

SUGAR-LOAF POINT LIGHTHOUSE is in lat. 32° 26′ 10″ S., long. 152° 33′ 20″ E. A *revolving bright* light is shown from it, attaining its greatest brilliancy every half minute, elevated 258 feet above the sea, and visible 22 miles.

A lower *fixed green* light, visible 3 miles off, is also shown between South and S.E. by E. ½ E., covering Seal Rocks and adjacent dangers, but not Edith Breaker, which lies S.W. by S. ½ S. 3 miles from Sugar-Loaf Point. Vessels should keep out of the range of the green light in rounding the point.

PORT STEPHENS.—The aspect of the land from the offing of the port makes in conical detached hills, of which Yacaaba Head, on the North side of the entrance, will be readily distinguished; as will also Toomeree Head, on the South side, by its being the northernmost of four conical hills. But the lighthouse on Stephens Point, so clearly marks the approach, as to prevent any mistake, either by day or night.

Stephens Point is a low rocky projection on the South side of the entrance of Port Stephens, sloping down from a hummocky summit, and is fronted by rocky ground, upon parts of which the sea breaks.

The Lighthouse on Stephens Point, in lat. 32° 45′ 10″ S., long. 152° 13′ 20″ E., is a white, circular stone tower 73 feet high, built on a knoll 66 feet above the level of the sea. The light *revolves* every minute, showing a *bright* and *red* flash alternately, and may be seen at a distance of 17 miles from seaward, between the bearings of N.E. and S.W. by S., with the exception of a slight interruption by the islands off the entrance of Port Stephens.

The light will afford a good guide for vessels seeking shelter in Fly Road, between Stephens Point and Toomeree Head; it is also a leading mark for entering between Toomeree and Yacaaba Heads, as the light will not be shut in until it bears S. by E. ½ E.

A *fixed light*, elevated 175 ft., and visible 9 miles, is also exhibited on *Nelson Head*, on the South side of the harbour, 1½ mile westward of Toomeree Head. It shows *bright* seaward, is *eclipsed* over Entrance Shoal, is *red* within after the shoal is passed and when Nelson Head can be steered for, and is again *bright* when Nelson Head is passed; it can then be used as a guide for anchoring or proceeding further into Port Stephens. There is a signal station on Nelson Head.

Yacaaba, or *North Head*, is a peaked hill 756 ft. high, with a steep and precipitous descent to the sea on all sides, except at its junction with the mainland, with which it is connected by a very narrow and low strip of sand, clothed with shrubs.

Toomeree, or *South Head*, also rises abruptly to a conspicuous summit, at

an elevation of 547 ft., with three equally conspicuous hills to the southward of it, all being separated from each other by low land. From the West side of Toomeree Head a spit extends in a N.N.W. direction for about half a mile, at the extremity of which the least depth is 2¼ fathoms, immediately deepening to 4 and 5 fathoms. A ground swell generally rolls upon this spit, and it frequently breaks on *Entrance Shoal*, a 9-ft. patch close within the extremity.

Off the entrance to Port Stephens there are three islands; the northernmost and largest, named *Cabbage Tree Island*, lies 1 mile north-eastward of Yacaaba Head, and partly shelters Providence Bay, the anchorage northward of the head, where vessels may ride securely during a southerly or westerly wind. The anchorage, however, in *Fly Road*, between Toomeree Head and Stephens Point, is more convenient and safe should the wind veer to the eastward, as the port is under their lee.

The entrance to Port Stephens bears N.N.W. 2½ miles from the lighthouse on Stephens Point and 2 miles West of Boondelbah Isle, the southernmost of those off Yacaaba Head; it is two-thirds of a mile wide, the fairway channel being about two-thirds over towards Yacaaba Head; nearer to, or farther from which, the course should be held according to the direction of the wind.

In approaching Port Stephens from the southward, give the islet which lies close off the East extreme of Stephens Point, a berth of nearly half a mile in passing, to avoid the rocky ground which extends a cables' length or more from the island. The leading mark for crossing the entrance from Toomeree toward Yacaaba, to keep without the spit, is Mount Stephen open of Toomeree, S. by E. ¼ E. This can nearly always be seen, leading across the eastern tail of the Entrance Bank in 27 feet.

At night, vessels seeking shelter in Nelson Bay can run for the harbour light (bright) until the revolving light on Point Stephens is lost sight of, when it will be necessary to alter course to N.N.W. until the harbour light is lost sight of and again made out *red*, a course can then be shaped for it, and when the head is passed the bright light will reappear. Nelson Head may be passed within half a cable, if necessary, in 10 fathoms of water.

The northern end of the sandy beach in Nelson Bay kept in line with and about halfway down the South slope of Toomeree summit, bearing E. ½ N. nearly, will lead northward of the rocky knoll off Red Patch Point, and carry a vessel in 24 to 27 ft. across the bank stretching to the northward from Sandy Point and Corlette Head.

There is a telegraph station at Nelson Bay, as also at the lighthouse outside.

Small vessels bound from Port Stephens to the northward can pass between Cabbage Tree Island and Yacaaba Head, passing the latter about 2 cables distant, and keeping close along inshore to avoid the current, will find a deep-water channel between the main land and the Broughton Islands.

NEWCASTLE HARBOUR, formerly known as *Port Hunter*, lies somewhat embayed between Norah Head and Morna Point, which lie respectively

S. by W. ½ W. 24 miles and N.E. by E. 18 miles from the entrance; but the coast is free from outlying dangers, with from 13 to 22 fathoms water between 2 and 3 miles from the shore.

Nobby Head, formerly an islet—but now connected with the mainland to the south-westward, by a breakwater half a mile long—is the southern head and rounding point of Newcastle Harbour, and lies in lat. 32° 55′ 20″ S., long. 151° 49′ 8″ E. It rises abruptly to the height of 92 ft. above high-water mark, and is 9 yards in diameter at the summit, which is surmounted by a white lighthouse, 34 ft. high. A breakwater is being constructed, and now extends about 600 yards in a N.E. direction from Nobby Head.

Lights—Nobby Head light is *fixed bright*, elevated 115 ft. above high water, and visible 17 miles, when bearing between N. by E. and S.W. by W., being shut in to the westward of the latter bearing by Morna Point.

As the shore forms a slight indentation between the entrance of Newcastle Harbour and Morna Point, it admits of the light being visible from a little westward of the bearing, S.W. by W.; but when so seen from a vessel, she would, if not actually on shore, be in very shallow water on a dangerous coast.

At 145 yards within the extremity of the breakwater, in course of construction N.E. of Nobby Head, a *fixed red* light is shown, elevated 30 ft., and visible from seaward between W.N.W. and E.N.E., the former bearing leading clear of Big Ben Rock, the latter clearing the shoal ground N.W. of the breakwater. A *bell* is sounded in foggy weather.

On the East side of the breakwater connecting Nobby Head with the mainland, are the *Bull Beacons*, on which leading lights are shown, which in line astern, E. by N., lead through North Channel into the North Harbour, in not less than 20 feet.

At 1½ cable West of the Bull Beacons is a lightvessel, moored in 9 ft. water, showing two *fixed red* lights. A *bell* is sounded in foggy weather.

The Signal Station on Nobby Head has two signal masts, bearing N.W. by N. and S.E. by S., which kept in line clears the N.E. edge of the Oyster Bank. The commercial code and the local harbour signals are both used at this station, the latter being exhibited to show the state of the tide, and whether it is prudent or otherwise to approach the harbour.

Vessels having approached sufficiently near the entrance of Newcastle Harbour to decipher the signals exhibited from the signal station, must pay strict attention to the instructions communicated by them, as it is impossible to get into the harbour against strong South, or south-westerly winds, and serious consequences are likely to befall a vessel attempting to enter the harbour in defiance of the requests made from the signal station. The bar has 21 ft. water over it at low water springs. It is high water, on full and change, at $9^h\ 0^m$; springs rise 3½ to 5 ft. The streams run 2 to 5 knots.

The *Breakwater*, which connects Nobby Head with the mainland to the south-westward, tends to direct the tide stream through the entrance channel,

and also to protect it from the surf and swell, which in a S.E. gale render access to Newcastle Harbour difficult and dangerous.

Old Signal Hill, on which is the pilots' look-out station, is a hummock, rising abruptly from the rocky ledge at the S.W. end of breakwater, and is distant about half a mile from the lighthouse on Nobby Head. The two beacons on Old Signal Hill kept in line clear Oyster Bank.

Masters of vessels are particularly cautioned not to approach too close to the port without having been first boarded by a pilot, and to cause the usual signal to be made, of hoisting the union jack at the fore.

Vessels requiring a pilot during the night should keep well to windward off Nobby Head, and burn a blue, or flash-light, which will be answered by the watch at the pilot look-out station, on Old Signal Hill.

Whenever the pilot is outside and in a good position, he will burn a blue light, when the vessel requiring a pilot should take the bearing and steer in that direction, showing a light for the pilot's guidance.

Rocky spits and foul ground project 2 cables from Old Signal Hill and from the next bluff to the south-westward; but those most in the way of passing vessels are the Outer Ledges, which extend from Nobby Head one-third of a mile to the eastward, having their N.E. extremity in line with the signal station and the highest obelisk, erected on the hill above the city of Newcastle, bearing S.W. $\frac{1}{4}$ W. A rocky spit also extends about a cable north-eastward of Nobby Head, over which the breakwater is constructed.

ENTRANCE to NEWCASTLE HARBOUR.—Haul-round Sand, the S.E. spit of Pirate Point, forms the North line of Newcastle Harbour, and the Oyster Bank or North-West Sands bound the entrance of the harbour on the N.W. side, the deep water or 4-fathoms channel, being here little more than 1 cable wide.

Two *leading lights* are shown from the obelisks over the city, on the hill, between the Scotch and Roman Catholic churches. A *bright* light seen over a *red* light at night kept in line, bearing S.W. $\frac{1}{2}$ S., will lead in mid-channel clear of the 13-ft. rock off Boulder Point on the N.W. side of the breakwater, and up to the lightvessel off the Government boat shed. By day the red and white towers in which the lights are placed will be seen, and answer as leading marks, the red tower being the upper one.

This port should never be attempted without a pilot. A vigilant look-out is always kept from Nobby Head, and from the harbour-master's hill, and vessels with the signals flying are promptly attended on by both pilot and tug steamer.

A storm-signal flag-staff, in communication with Sydney and the various ports and lighthouses on the coast, is erected on the harbour-master's mound; on a gale reaching the several stations, its force and direction are shown on the staff, the flags denoting the name of the port it has arrived at. Its strength is indicated by signals similar to those in use at Sydney.

Nearly 3 cables N. by W. ½ W. from Nobby Head lighthouse, on the North side of the channel, is a green wreck buoy, showing the position of the *Cawarra* steamer, which foundered when endeavouring to enter the harbour during an easterly gale, in July, 1866. Many vessels have been lost on entering this harbour, resulting nearly in every case through an endeavour to enter during S.E. and easterly gales.

The easterly and S.E. gales on this coast are always accompanied with incessant rains, flooding the low lands, and causing strong freshets in the rivers. They raise a mountainous breaking sea at the entrance of the harbour, in a line from the outer end of the reef off Nobby Head (*Big Ben*) across to the eastward of the Oyster Bank. This mass of breaking sea would of itself be sufficient to overwhelm ordinary-sized vessels; but when, in addition, a freshet of 6 or 7 knots sets out of the river against this heavy easterly roll, to attempt to enter is almost certain destruction. It is, therefore, to be impressed on seamen, that during a hard East or S.E. gale with rain, which has lasted more than 24 hours, not to attempt to enter Newcastle, but either keep to sea, or make for Port Stephens.

There are two *lifeboats* stationed at the port, under the control of a local lifeboat committee or trust, with an established crew of eleven men, who are paid and exercised once or twice a month.

The city of *Newcastle* has considerably improved of late years, consequent on the great increase in its export of coal, the total output in 1882 amounting to 1,283,769 tons. A railway extends to Armidale, 260 miles northward of Newcastle, and to Narrabri, 252 miles to the N.W.

Coal.—Steam cranes and loading shoots are worked on the Government wooden wharf on the South shore of the harbour, where vessels can load to 14 and 16 ft. draught; above that, they must haul out to moorings in the Horse-shoe, and complete to any draught under 22 ft. by lighters. The Waratah Company has a private railway and shipping staiths at the North end of Bullock Island, 3 or 4 miles up Hunter River. Altogether there is now about 5 miles of wharfage.

Steam tugs are employed constantly at this port in bringing vessels in and out, and moving them in the harbour. *Hunter River* is daily navigated by large coasting steam-ships as far as Morpeth, a distance of 23 miles.

There is a patent slip at Stockton, on the North shore of the harbour, capable of taking up ships of 300 to 1,000 tons. The charge for taking up is 1*s.* per register ton. Rent 6*d.* per ton per day. Every description of repairs can be accomplished.

A dock, with an area of 90 acres, is to be constructed at Bullock Island, and will be dredged to a depth of 23 ft.

Time Signal.—On the top of the Custom House, at 58 ft. above high water, a ball is hoisted halfway up at 5 minutes before the signal, and at $1^h\ 0^m$ p.m., Sydney mean time ($1^h\ 2^m\ 22{\cdot}6^s$ local time), it is dropped. Its position is

lat. 32° 55′ 50″ S., long. 151° 48′ 21″ E. of Greenwich, or 14h 57m 31·8s in time.

BROKEN BAY, 16 miles to the northward of Port Jackson, is easily made out when coming from the southward, *Baranjo Head*, on the South side of the entrance, being a peninsular hill, 310 ft. high, at the North extreme of a reddish-coloured beach, forming the eastern boundary of Pitt Water. At 3½ miles southward of Baranjo Head is a remarkable perforated cliff, known as the *Hole in the Wall.*

Light.—A *fixed red* light, elevated 370 ft., and visible 15 miles, is shown from Baranjo Head, between S.S.E. and N.E. ½ N.

In coming from the northward the entrance is more difficult to make out, *Cape Three Points*—at 7 miles north-eastward of Baranjo Head—projecting so far to the eastward, and the head, from that direction, being on with the high back-ground, is not easily distinguished.

Between Cape Three Points and Hawk Head, on the North side of the entrance, are the East and West Reefs, two small patches mostly awash, at only a short distance from the land.

The entrance of Broken Bay is about 2 miles wide, between Baranjo and Hawk Heads, both of which may be approached within half a mile. *Eliot Isle* is small, and 284 ft. high, lying one-third of a mile eastward of Middle Head, and equidistant from Baranjo and Hawk Heads.

In entering Broken Bay, the depth decreases from 12 to 3 fathoms, as there are shoals, forming a bar across an inner entrance between Middle Head and the promontory on the South side.

A 14-ft. patch, the most shallow part of the bar, lies about one-third of a mile off the South shore, with Hawk Head just shut in by the S.E. extreme of Eliot Isle; to avoid it, keep 2 cables' lengths from the South shore, where the depth is not less than 3½ fathoms, observing that as long as Hawk Head is open of Eliot Isle, a vessel is to the eastward and southward of the patch.

PORT JACKSON.

PORT JACKSON is the principal harbour on this side of the Pacific, and well deserves the pre-eminence it has attained. It is easy of approach, and affords every advantage as a port. The following are the directions which have been drawn up in connection with the surveys by Capt. Denham:—

In approaching Port Jackson from the eastward, the summit of the northern of the two Sydney Heads will, in clear weather, be first seen, from its being considerably higher than the adjacent coast. As the port is neared, it will be

easily identified by the lighthouse and signal station on the Outer South Head, and the bold, perpendicular profile of the North Head.

Outer South Head, on which are the signal-tower, semaphore, and flagstaff, is a precipitous projection of the coast, which here consists of coarse sandstone cliffs, of a light reddish colour: the summit of the head is 300 ft. above the sea.

Light.—The Outer South Head lighthouse is a white circular stone building, 76 ft. in height, standing near the edge of the cliff, at a quarter of a mile to the southward of the signal station, and in lat. 33° 51′ 15″ S., long. 151° 18′ 15″ E. A *bright electric* light is shown, *revolving* every minute, placed at an elevation of 344 ft. above the level of high water, and visible in clear weather from the distance of 25 miles at sea, between the bearings of N. by W. and S. by W. ¼ W. The light is shown from a new lighthouse; the light in the old Macquarie lighthouse was discontinued in June, 1883.

From the Outer South Head the cliffy coast line trends N.W. by N. ½ N. 1 mile, to Inner South Head, which forms the rounding point on the southern side of the entrance of Port Jackson.

The Gap.—Midway between the Outer and Inner South Head lighthouses, the profile of the cliffs breaks down to a deep hollow and indentation of the coast, known as the Gap, which is so remarkable, that it has in a dark night even been mistaken for the entrance of Port Jackson. Gap Bluff, a projection immediately to the northward of the Gap, rises to the height of 300 ft.

Inner South Head.—From Gap Bluff the ridge gradually descends to the Inner South Head, which is 60 ft. above high water, and has a lighthouse erected upon its extremity.

Light.—The Inner South Head lighthouse, which is intended for actual guidance into the harbour, after the more lofty Outer South Head light has shown proximity, is a tower, 30 ft. high, painted red and white in vertical stripes, and built upon the edge of the Inner South Head. It shows a *fixed bright* light, at an elevation of 90 ft. above high water, visible in clear weather at the distance of 14 miles from the eastward, between the bearings of N.W. by N. and S.W. ¼ W. The light suddenly opens out from Gap Bluff upon the former bearing, if coming from the southward, when abreast of, and 5½ miles off, Botany Bay heads.

South Reef is a ledge of rocks extending nearly a cable northward from the base of the Inner South Head, and is the only projecting spit to attend to between the Inner South and North Heads.

The *Outer North Head*, on the North side of the entrance of Port Jackson, is a table-surfaced, sharp-elbowed, perpendicular cliff, 242 ft. high, N. by E. ¼ E., 1¾ mile from the South Head signal station. The *Inner North Head*, W. ½ N. nearly three-quarters of a mile from the Outer Head, is a projection of the cliffy coast, extending from the Outer Head, and forms the North side of the entrance of Port Jackson.

Entrance of Port Jackson.—The narrowest part, or what may be considered

the actual entrance of Port Jackson, is between the Inner Heads, and is a little more than three-quarters of a mile across from cliff to cliff, N. by E. ½ E. and S. by W. ½ W., but this breadth is reduced by a rocky spit on both sides to exactly three-quarters of a mile. The entrance is clear of dangers, and the soundings are regular, the depth in mid-channel being 17 fathoms, sand.

The *Sound* is the name assigned to that part of Port Jackson immediately within the entrance, and which branches off into Spring Cove and North and Middle Harbours. It is too exposed to the ocean swell to afford safe anchorage, except with off-shore winds.

Middle Head, W.N.W. two-thirds of a mile from Inner South Head, is a lofty, precipitous, bold bluff, of whitish free-stone, immediately facing the entrance of Port Jackson; as it is exposed to the ocean swell, the sea breaks upon it with great violence during easterly winds.

Two obelisks, each 30 ft. in height, have been erected upon the western shore, facing the entrance to the Sound; that nearest the sea is situated at the edge of the first elbow of the coast, immediately to the southward of Middle Head; the western, and upper obelisk, stands upon the wooded slope, and bears W. ½ S. from the former. These two kept in line give the leading mark for clearing the South Reef and the northern edge of the Bar and Flats.

The *Bar and Flats* and *Sow and Pigs*, which extend across the actual mouth and threshold of the Sydney and Paramatta estuary, limited the capacity of the harbour to the admission of vessels of 20 ft. draught at low water spring tides, or 25 ft. at high water, in fine weather. The nucleus of this bar consists of a group of rocks, showing at half tide, and marked by an *iron beacon* rod, surmounted by an open hooped ball. This beacon is fixed nearly midway between the shores on either side. The channels on either side of these shoals were surveyed by Lieut. Richards, in 1878. Extensive dredging operations are being carried on in the Eastern Channel, to render access easy for vessels of the heaviest draught.

The Sow and Pigs Lightvessel, painted red, is moored in 21 ft. water, at half a cable's length to the north-westward of the outer of the two spurs forming the North extremity of the Sow and Pigs Shoals, and nearly 1 cable's length from the beacon. The lightvessel shows a red flag by day, and two *fixed bright* lights, placed vertically 6 ft. apart upon one mast, by night; the upper light is 28 ft. above the water, and visible from the north-eastward in clear weather at the distance of 6 miles.

The *Western Channel*, which crosses the Bar and Flats on the western side of the Sow and Pigs Shoals, carries 21 ft. at low water, over a sandy bottom. The lightvessel is situated so as to render this an available night channel, which may be taken without a pilot, in moderate and clear weather, by any one who has studied the plan and directions.

Leading marks for clearing the shoals on either side of the Western Channel:—The spire of a new Wesleyan chapel at Woolomoloo (nearly on the site of

Craigend mill) kept a little open of Bradley Point, bearing S.W. by S. ¼ S., leads through the West Channel and clear of the 18-ft. patches on the northern edge of the Bar and Flats, and Sow and Pigs Shoals, on their western sides. (Mark C.).

Watson Bay, South of the Inner South Head, is the lifeboat and pilot station, and as there is smooth anchorage in from 6 to 7 fathoms, outward-bound vessels frequently anchor here to wait for a fair wind.

Eastern Channel.—Now that the entrance of the Eastern Channel across the Bar and Flats is defined by leading marks, with deeper and much smoother water, and as it is but half the distance, as compared with the Western Channel, it may be expected that the Eastern Channel will be more frequently used. The outer narrows of the Eastern Channel, where the soundings quickly decrease from 8 to 4½ fathoms, lie between the South Reef and the north-easternmost 18-ft. patch of the Sow and Pigs Shoals, forming the northern entrance of the channel, which is there nearly a quarter of a mile wide, the leading marks for, and through the centre of which, are the two eastern obelisks, of white stone, half a mile apart, one on Green Point, the other on Vaucluse Point, bearing, when in one, S. ¼ E.

The *Leading Marks* for the Eastern Channel, and cross mark for the southern edge of the Sow and Pigs Shoals :—The two Eastern obelisks in line S. ¼ E., lead into and through the northern entrance of the Eastern Channel, as above. This line, however, passes just westward of the shoal off Lady Bay, in 19 ft.

The obelisk on Green Point in line with the chequered red and white obelisk on the East side of Parsley Bay, bearing S. by E. ¾ E., leads nearly in mid-channel through the northern entrance of the Eastern Channel, in 26 ft. at low water. (Mark D.).

The best marks, however, for this channel are the two towers near Vaucluse Bay, which, in line S. ⅜ E., lead through the dredged channel in not less than 27 ft. at low water. At night a *red light* is shown on each tower. The northern tower stands on the eastern point of Vaucluse Bay, and the other stands about half a mile to S. ⅜ E. (Mark B.).

St. James church spire, its breadth open of Bradley Point, bearing S.W. ½ W., leads clear of the south-eastern 17-ft. elbow of the Sow and Pigs Shoals. (Mark F.).

The Outer South Head lighthouse, its breadth open to the southward of the *red* and *white* chequered obelisk, upon the wooded slope on the East side of Parsley Bay, bearing S.E. by E. ¾ E., shows that the south-western, or inner edge of the Bar and Flats has been passed. (Mark E.).

Port Jackson, above the Bar and Flats, is so free from dangers, and is so clearly represented on the plan, that there will be no difficulty in proceeding toward the city.

Shark Island is small and thickly wooded, of moderate height, and E. by

S. ½ S. two-thirds of a mile from Bradley Point; a spit of foul ground extends nearly a cable's length from its N.W. end.

Clark Island lies S. by W. ¼ W. two-thirds of a mile from Bradley Point; the water is deep around it.

Garden Island, which lies nearly a mile to the south-westward of Bradley Point, is considerably larger and higher than the others; it may be approached to the northward, to half a cable's length; but a shallow spit runs out from its South point. Garden Island is, with certain ordnance reservations, appropriated to naval purposes. It affords a quiet spot for astronomical and other observations; the slab for observing upon is in lat. 33° 51′ 54″ S., long. 151° 14′ 47″ E., from which the *true* bearing of the Outer South Head lighthouse is N. 82° E.; the variation being about 9° E. in 1884.

Fort Denison and *Light.*—Fort Denison (formerly Pinchgut Islet) lies about a quarter of a mile to the north-westward of the North end of Garden Island. This islet, unlike the others just described, is a mass of bare rock and masonry, with a martello tower on its N.E. extreme, which shows a *fixed red* light for the more especial purpose of guiding steamers and coasters. Vessels from foreign ports are forbidden by the port regulations to pass this light until boarded by the health officer and other authorities. There is deep water round the islet, but it should not be passed within half a cable's length on account of two small spits running out a small distance from it.

Fort Macquarie, from which the longitudes of the recent surveys of the coasts of Australia have been measured, is in lat. 33° 51′ 42″ S., long. 151° 14′ E. The fort is situated at the North extreme of the point which separates Farm Cove from Sydney Cove. Shoal water runs out about a cable's length from the point, the spit being marked by a *red* buoy.

The custom of the port reserves Farm Cove for the anchorage of men-of-war; but as four large vessels could not berth in Farm Cove, Man-of-War Road may be considered to extend from Fort Macquarie to Garden Island, as merchant vessels scarcely ever need, and are not expected to, anchor within that space.

SYDNEY has every facility for the repairing and supply of shipping. There are no light dues, and the charges on shipping are very moderate. There are excellent dry docks and repairing slips, as hereafter described; pilots and steam-tugs are to be had on the usual signals. An electric telegraph communicates with the Outer South Head. The place is so well known, that it needs no further description here. In 1881 the population of the city amounted to 99,670, or with the suburbs 220,427.

Railways.—The Great Southern Line, completed in 1883, extends 386 miles from Sydney to Albury, where it joins the Victorian North-Eastern Railway from Melbourne. The distance between Sydney and Melbourne is about 583 miles, covered in 21 hours by the express train. The Great Western line, about 377 miles long, now extends to Nyngan, and the South-Western line to Hay, 454 miles from Sydney.

Time Signal.—On the top of the Observatory, 213 ft. above high water, a ball is hoisted halfway up at 5^m before the signal, and at 1^h 0^m p.m., Sydney mean time, it is dropped. Lat. 33° 51′ 54″ S., long. 151° 12′ 42″ East of Greenwich, or 14^h 55^m $9{\cdot}2^s$ in time.

The Fairway of Port Jackson may be divided into three sections: the first, W.N.W. 1¼ mile from the line of the Outer Heads; the second, S.S.W. 2¼ miles across the Bar and Flats, and up the sea reach to abreast of Bradley Point; and the third, which is the harbour reach to Sydney, W. ½ S. 1¾ mile, being but a run of 5¼ miles altogether, and which, at an 8-knot rate, is to be accomplished, against the ebb, in three-quarters of an hour, and in half an hour with the flood stream.

The first reach, and the channels across the Bar and Flats, having already been described, the second reach thence to abreast of Bradley Point, and the third reach now remain to be noticed.

The average breadth of the harbour, between the Bar and Flats and Bradley Point, is about half a mile, the soundings in mid-channel ranging from 7 to 16 fathoms, with sandy bottom. Between Bradley Point and Shark Island, the working room is nearly half a mile, allowing for the rocky spits which project about a cable's length on either side. Shark, Clark, and Garden Islands may be considered as forming the southern boundary of the Fairway channel; but in working, vessels may advantageously make longer boards to the southward, between the islands, towards Rose, Double, and Rushcutter Bays; they may also, when past Bradley Point, stand to the northward on either side of Careening Point, which will afford from two-thirds of a mile to nearly half a mile working room, merely keeping about half a cable's length clear of the spits running out from the points, to the westward of Bradley Point. There is easy anchorage, in 10 fathoms, anywhere in mid-channel, and no tide to prevent a smart vessel, under a top-gallant breeze, turning to windward.

The Sound only affords temporary anchorage, with off-shore winds, to the northward of the Bar and Flats, where vessels may wait for a steam-tug, or for a favourable opportunity for crossing the Bar and Flats; but there is good anchorage in Watson Bay, and immediately to the south-westward of the Sow and Pigs Shoals; and should a vessel be baffled or assailed by those crippling gusts locally known as southerly bursters, or get perplexed as to threading her way amongst the shipping, she can find good anchorage, in not more than 13 fathoms, with good holding ground, anywhere in the harbour reach, by merely giving the islets and points a berth of 2 or 3 cables' lengths. At night, when anchored in the way of passing vessels, a light is required to be shown.

Few harbours possess so much room with smooth water as Port Jackson, from its branching into numerous arms and deep inlets, with steep projecting points between them; almost every yard of shore presenting a natural wharf.

The circular quay at the head of Sydney Cove has a length of 1,300 yards

available for the largest vessels. Wooloomooloo Wharf, to the East, is 1,200 feet long.

The eastern shore of Darling Harbour, which skirts the western side of the city, has its frontage entirely occupied with wharves and quays. Here all the inter-colonial steam companies have their stations, and the gas company its large works. On the North, from Miller's Point to Dawes Point (which includes all one end of the city), and from thence round the largest headland of the port, the waterside is also fully taken up by commercial premises, with the exception of the site at Dawes Point, on which there is a battery.

Docks, Patent Slips, and Careening Establishments.—Every facility is to be obtained at Sydney for repairing vessels of any size or description, with abundant supplies and stores of every kind.

Fitzroy Dock is the Government dry dock at Cockatoo Island, at about 2 miles above Sydney Cove. The dock is 450 ft. long, and has a depth of 20½ ft. over its caisson-sill, at high water springs, and 19 ft. at neaps; the entrance is 59 ft. wide. Another dock, 630 ft. long, with 28 ft. over the sill, is being constructed.

Morts Dock is a private dry dock in the bight of Waterview Bay, on the South side of the harbour, at about 1½ mile above Sydney Cove. This dock is 409 ft. long and 68 ft. wide at the entrance, with a depth of 19½ ft. at high water springs, and 17½ ft. at neaps, over its sill; like FitzRoy Dock, it is pumped out by a steam-engine. There is also a patent slip here, available for vessels of 1,000 tons.

Pyrmont Patent Slip, at Darling Point, on the western side of Darling Harbour, belongs to the Australian Steam-ship Company. It is 800 ft. long, 400 ft. of which incline beyond low-water mark into 28 ft. depth, and it carries a cradle 280 ft. long, upon ways 45 ft. wide. The engine power is capable of hauling up a vessel of 2,000 tons in 5 hours.

Towns and Darleys Patent Slip is a smaller, but much used patent slip, situated on the eastern shore of Darling Harbour. It is about 400 ft. long, with its extremity 15 ft. under water, carrying a cradle 21 ft. wide.

A *Floating Dock* offers facilities for vessels up to 500 or 600 tons.

Vessels are occasionally hove down to the wharves in Darling Harbour, and likewise in Great Sirius Cove.

Steam Tugs.—There are steam tugs at Sydney, which may be summoned by signal when required.

Pilots.—The pilot station is at Watson Bay, within half a mile of the signal station on the Outer South Head, and the look-out is kept at the signal tower, from which the night signals of vessels requiring pilots will be answered. A powerful screw steamer has been added to the service. Pilots are ordered to keep night watch on the cliffs for vessels approaching the harbour, and to answer any signal that may be made, by showing a blue light. There is, as

already stated, an electric telegraph office at the signal station, communicating with Sydney.

Directions.—The most unfavourable times for entering Port Jackson are in easterly gales, southerly bursters, and light variable winds, with a ground swell rolling in upon the Heads.

Easterly gales sometimes blow very hard, causing a heavy sea upon this coast, which not only breaks with great violence upon Sydney Heads, but occasionally right across the entrance, and directly home to the Middle Head; a vessel, however, scudding in must approach within 3 cables' lengths of Middle Head, at the risk of being swept upon it by the hurling sea whilst hauling up, almost at right angles, to cross the Bar and Flats, and weather George Head, upon which the sea breaks also. Easterly gales are frequently attended by haze banks, which might prevent the lights being seen at night, until too late for a vessel to claw off the land; vessels should, therefore, day or night, keep the sea rather than bear up for Port Jackson in a gale from the eastward, and should not approach the coast within 10 miles, at which distance the Inner South Head light, if seen, will be dipping, and the soundings will be 70 fathoms, dark sand. It must be borne in mind when getting an offing, that the weather gauge will be to the north-eastward as the gale expends itself, and that in standing to the northward the vessel is safe as long as the Outer South Head light is not shut in by the Outer North Head, which it will be upon the bearing of S. by W., and then the soundings will begin to shoal to about 20 fathoms, within which line no vessel should approach the coast.

The southerly bursters are strong squally winds, which rush down the harbour and frequently embarrass sailing vessels when working up between the heads, sometimes taking them aback and exposing them to destruction against the North Head cliffs; vessels should therefore wait outside until the wind becomes more steady, unless she is in very good working order and the flood stream is in her favour.

Sailing vessels should not attempt to enter between the heads with light variable winds, as under such circumstances they frequently become unmanageable, and being left to the mercy of the ground swell, may be set upon either of the heads: to anchor and wait for a steady breeze, or summon a steam-tug, would obviously be the best way of getting out of this difficulty, before getting too near the heads.

If a vessel bound to Port Jackson should, from want of observations, be uncertain of her latitude, and fall in with the land either to the southward or northward of it, in blowing weather, she may find shelter either in Botany Bay which lies about 10 miles southward, or Broken Bay, lying 16 miles to the northward of Port Jackson; and it is of the utmost consequence that such vessels as may happen to be in bad condition, and unable to keep off shore, should be aware of these useful places of refuge.

Vessels approaching Port Jackson in the night, with southerly or westerly

winds, should keep the sea until daylight; but with winds from the northward or eastward, and favourable weather, they may safely enter.

To enter Port Jackson from the Southward.—When coming from the southward, if the weather be dark or thick, preserve a good offing until the Sydney Heads or the Outer South Head lighthouse is seen, in order to clear the projection of the coast about Botany Bay, where it is comparatively low, and where the current sometimes sets S.W. towards the shore.

Having clearly made out the Sydney Heads, and being abreast of the Outer South Head, if the wind be fair, steer to the north-westward, taking care not to bring the Outer South Head lighthouse to the westward of Gap Bluff, in order to clear the South Reef; but, as the sea generally breaks upon it, it may easily be seen, and with a commanding breeze may be passed in 8 fathoms, at a cable's length off. Soon after opening Middle Head, to the northward of Inner South Head, with the latter bearing S.W., pick up the leading mark A, by getting the two *white* obelisks on the western shore in line, bearing W. $\frac{1}{2}$ S., which will clear the South Reef and the 18-ft. patches on the northern edge of the Bar and Flats.

West Channel.—Steer in upon the leading mark A (p. 1011), until the spire of the new Wesleyan chapel is nearly in line with Bradley Point, bearing S.W. by S. $\frac{1}{4}$ S.; this will be the leading mark C (p. 1011), to which the course must now be altered, and this will lead through West Channel, clear of the Sow and Pigs Shoals, passing at about $1\frac{3}{4}$ cable westward of the lightvessel. The soundings, when passing the 18-ft. patches on the northern edge of the Bar and Flats, will decrease from 7 to $5\frac{1}{2}$, and then to $3\frac{1}{2}$ fathoms, which will be the depth until through West Channel, when the water will quickly deepen to 10 fathoms, as the Outer South Head lighthouse opens its breadth to the southward of the *red* and *white* chequered obelisk below it (mark E), bearing S.E. by E. $\frac{3}{4}$ E.

The Bar and Flats being now cleared, steer S.S.W., passing between Bradley Point and Shark Island; round the point at the distance of about a quarter of a mile, to clear the spit running out from it, and then proceed westward for Sydney.

In beating through West Channel, the deepest water will be found on the western shore, with the exception of the 17-ft. shoal extending north-eastward from George Head. Avoiding this shoal, the western shore may be made free with to the distance of half a cable's length; but in standing over to the eastern side, northward of the lightvessel, the 18-ft. patch on the northern edge of the Bar and Flats must be cautiously avoided, by not allowing the lightvessel to bear to the westward of S. by W. $\frac{3}{4}$ W.

Abreast of George Head, West Channel is contracted to little more than $1\frac{1}{2}$ cable's width by the 17-ft. ridge forming the S.W. extreme of the Sow and Pigs Shoals; to clear this, the obelisk on the South slope of the North Head promon-

tory must be kept a little open to the westward of the lightvessel, until the Outer South Head lighthouse is open at least its own breadth to the southward of the *chequered* obelisk below it, when the Bar and Flats will have been passed.

Vessels of heavy burthen, or drawing more than 18 ft., ought not, with a fresh wind, to attempt to work through either of the narrow channels across the Bar and Flats; but vessels of lighter draught than 14 ft. can stretch right across from shore to shore, North of the lightvessel, passing over the 18-ft. patches on the northern edge of the Bar and Flats, and that portion of the Sow and Pigs Shoals lying to the southward of a line from George Head to the obelisk on Green Point, which bear nearly East and West from each other.

A vessel of war, if bound for Man-of-War Road, should, when abreast of Garden Island, haul up between it and Fort Denison, if proceeding to Garden Island anchorage, when she may come to in 7 fathoms, with Inner South Head lighthouse in line with the North extreme of the island.

For Farm Cove, haul in between Fort Denison and Lady Macquarie Point, taking care not to close the Outer South Head lighthouse with the North bluff of Garden Island, and anchor in 6 fathoms, between Fort Macquarie and Lady Macquarie Point.

In proceeding to the Government Dock at Cockatoo Island, it is only necessary to keep in mid-channel, until off Balls Head—about a mile above Sydney Cove—where attention is called to a 19-ft. patch, half a cable's length in diameter, lying in mid-channel between Balls Head and Longnose Point; to clear which to the southward, Dawes Battery flagstaff should be kept a little open of the water-police station, at the North extreme of Goat Island, taking care, after passing the patch, to avoid Longnose Point by keeping Blues Point just shut in by Balls Head. Then, after clearing Longnose Point, steer for Cockatoo Island, at the S.E. elbow of which is FitzRoy dry dock, denoted by the steam-engine chimney.

East Channel.—A vessel from the southward, able to lay a S. $\frac{1}{2}$ E. course, should pick up the leading mark A, as already directed, and proceeding on this mark, look out upon the port beam for the eastern obelisks, on Green and Vaucluse Points. As these obelisks come in line haul up for them S. $\frac{1}{4}$ E., carefully preserving their line for the first quarter of a mile, when the locking of the Outer North and the Inner South Heads will indicate being through the narrows. The vessel may now be edged off nearly a point from the leading mark, and when drawing in abreast of Camp Cove, between Inner South Head and Green Point, steer S. by W.; taking care not to open the sea-mark obelisk on the South slope of the North Head promontory after once closing it with the Inner South Head, until St. James church spire is its breadth open to the southward of Bradley Point—mark F—bearing S.W. $\frac{1}{2}$ W., which will lead clear of the S.E. extreme of the Sow and Pigs Shoals.

The best course, however, in taking the East Channel is to keep on the

leading mark A till the light-towers near Vaucluse Bay come in line S. ⅜ E., mark B, which will lead through the dredged channel in not less than 27 ft. at low water, till the leading mark F comes on. *By night* the *red lights* in line lead through; there is anchorage on the leading mark in about 7 fathoms, with the Outer South Head lighthouse bearing S.E. ½ E.

By night from the Southward.—A vessel from the southward being abreast of, or at about three-quarters of a mile to the eastward of the Outer South Head revolving light, with the Inner South Head fixed light well open of the Gap Bluff, bearing N.W., should steer N.W. by N. until the Inner South Head light bears S.W., by which time the floating light should be well open upon the bearing S.W. by W. ¼ W.; then steer West, which will clear the South Reef and the 18-ft. patches on the northern edge of the Bar and Flats, rounding the breakers on the former, at the distance of a cable's length, in 9 fathoms. When the floating lights bear S.S.W. steer S.W. by S., passing at about a cable's length to the westward of the lightvessel; continue this course until the Outer South Head light bears E.S.E., when the Bar and Flats will have been passed, and the vessel may anchor in 9 fathoms, with the Outer South Head light bearing E.S.E. and the floating lights N. by E.

Or, in fine weather, by keeping a sharp look-out, a vessel may proceed to abreast of Sydney, first steering S.S.W. until the Outer South Head light bears nearly E. by N. ½ N., and the *red* light on Fort Denison West; then steer West for the *red* light, which may be passed on either side, at the distance of a cable's length, and by bringing it astern in line with the Outer South Head light, bearing E. by N., the vessel will clear Fort Macquarie spit, and may anchor in Sydney Cove, in 7 fathoms, mud.

A vessel of war going to any part of Man-of-War Road, should, from abreast of Bradley Point, steer westward towards Fort Denison light, and when North of Garden Island, haul in to the southward, between it and the fort, if bound for Garden Island anchorage, which will be entered as soon as the Outer South Head light is shut in by the northern bluff of the island, bearing E. by N. ½ N.

If bound for Farm Cove, and any vessel which might be lying there can be discerned, proceed to the westward, between Fort Denison and Lady Macquarie Point, taking care in passing that point, not to close the Outer South Head light with Garden Island bluff; a good berth may then be picked up, in 8 fathoms, mud, with Fort Macquarie bearing about West, and Fort Denison N.E.

From the Eastward.—A vessel proceeding for Port Jackson from the eastward will find the latitude (33° 50′ S.) the best guide for making the port. When the heads are clearly distinguished, bring Middle Head, which faces the entrance, to bear West, and steer for it upon that bearing, until the western obelisks, immediately to the south-westward of Middle Head, are made out; then get them in line, bearing W. ½ S., and having thus picked up leading

mark A, and cleared the South Reef, haul up for crossing the Bar and Flats by West or East Channel, as most convenient, and proceed as directed when entering from the southward.

At Night, as in the daytime, the latitude must be in great measure depended upon for making Port Jackson from the eastward, until the Outer South Head revolving light, and afterwards the Inner South Head fixed light are distinguished. When the Inner South Head light first becomes visible, it appears dipping at the distance of about 10 miles from the land, the soundings being 70 fathoms, dark sand, and when at about 5 miles off, the depth will be 50 fathoms, fine sand.

When the Inner South Head light is distinctly visible, steer for it upon a West bearing, until the Outer South Head light bears about S.S.W.; then alter course to W. by N., so as to make sure of clearing the dangerous South Reef; and when the Inner South Head light bears S.W., distant about a quarter of a mile, and the lightvessel is well open, bearing S.W. by W. $\frac{1}{4}$ W., steer West again, round the breakers on South Reef at the distance of a cable's length, in about 9 fathoms water, and when the floating light bears S.S.W. steer S.W. by S. through West Channel, passing at about a cable's length on the West side of the lightvessel. When the Outer South Head light bears E.S.E. the Bar and Flats will have been passed, and the vessel may anchor or proceed up the harbour, as directed on page 1018.

From the Northward.—No especial directions are required for a vessel proceeding into Port Jackson from the northward in the daytime, as those already given for entering from the eastward, will answer every purpose, taking care to give the Outer North Head a good berth, especially with a light wind and a ground swell.

At night from the Northward.—A vessel from the northward entering Port Jackson by night has merely to keep the Outer South Head light to the westward of S.W. by S. $\frac{1}{2}$ S., to give her half a mile clearance to the Outer North Head, and looking out for the entrance, the quickly successive opening of the Inner South Head light, bearing S.W. $\frac{1}{4}$ W., and the floating light S.W. $\frac{3}{4}$ W. will indicate the vessel being nearly a mile to the eastward of the North Head promontory; and it is rarely so dark but that the black, towering North Head will show when to steer W. by S. $\frac{1}{2}$ S. for the entrance between the heads, which should be done just as the floating light comes on with the Inner South Head, bearing S.W. by W. $\frac{3}{4}$ W., remembering that the North Head will be cleared as long as the floating light is not opened to the northward of the Inner South Head. Continue a W. by S. $\frac{1}{2}$ S. course, in not less than 9 fathoms, as the South Reef and the northern edge of the Bar and Flats are being passed, until the floating light bears S. by W. $\frac{3}{4}$ W., then steer S.W. by S., through West Channel, passing at about $1\frac{3}{4}$ cable's length to the westward of the lightvessel. When the Outer South Head light bears E.S.E. the vessel may anchor, or proceed up the harbour, as directed on page 1018.

Working into Port Jackson.—A westerly wind, although a leading wind across the Bar and Flats and up Port Jackson, as far as Bradley Point, blows right out of the entrance; but there is ample working room, for a well-handled vessel, between the heads, the shortest board being half a mile between the South Reef and the Inner North Head; and, should it be ebb stream, it may be evaded by always tacking to the southward directly the lightvessel opens to the northward of the Inner South Head, until having worked up as close to the South Reef as brings the signal tower on the Outer South Head to touch Gap Bluff, bearing S. by E. $\frac{3}{4}$ E., upon which line the vessel may stretch to the northward, clearing the South Reef at a cable's length, and then haul close up on the port tack, directly the lightvessel opens to the south-westward. Here the ebb stream will catch the vessel on the weather quarter; but as she reaches across towards the North Harbour its strength, of 1½ knot, will be avoided.

It should be here stated that immediately outside the Bar and Flats, the ebb stream sets to the north-eastward, towards the Inner North Head, and then E.S.E., along shore, towards the Outer North Head, leaving the space from the line of the Outer Heads to the Inner South Head, in slack water during the ebb.

Caution.—To ensure success in beating in, and to avoid mishap, smart working, and readiness with both anchors will be absolutely necessary to cope with flaws and gusts of wind, as well as the ground swell, which perplex even those who frequent Port Jackson.

Tides.—It is high water between Sydney Heads, on full and change, at $8^h\ 15^m$, and at Garden Island at $8^h\ 30^m$; the rise at ordinary springs being 5 ft., and at neaps 4 feet.

In the offing, within the line of the currents, the ebb sets to the southward and the flood to the northward. Outside the Bar and Flats, as just stated, the ebb sets across the Sound, towards the Inner North Head, and then about E.S.E. close along shore in the direction of the Outer North Head, leaving all the space between the line of the Outer Heads and the Inner South Head in slack water, as regards the ebb stream. The ebb and flood streams set fairly across the Bar and Flats, N.E. and S.W., and up the harbour partake of the mid-channel trends; the ebb from Shark Island to the Bar and Flats setting N.E. and flood S.W.; and above Bradley Point the ebb stream East and the flood West; the maximum rate of the ebb being 2, and of the flood 1½ knot.

Jerusalem Bank.—In 1876, Capt. Largie, of the barque *Jerusalem*, reported an extensive bank of soundings, about 40 miles S.E. of the entrance to Port Jackson, in lat. 34° 20′ S., long. 151° 54′ E. Several soundings were obtained, the least depth being 20 fathoms.

BOTANY BAY is about 9 miles South of the entrance of Port Jackson. The entrance is clear, and lies between *Cape Banks* and *Cape Solander*, the latter in lat. 34° 0′ 45″ S., long. 151° 15′ 40″. The only danger is a sunken rock,

lying 1½ cable's length off the northern shore, a mile inside of Cape Banks, and nearly South from a tower standing on the inner head. Steer through mid-channel, between the heads, and when past the sunken rock, haul a little over to the northern shore, and anchor in 5 or 6 fathoms.

Waniora Point lies 5½ miles North of Wollongong. Within the bight to the N.W. of this point a coal station has been formed, named *Bulli*, where a wooden pier 700 ft. in length projects N.E. by E. over the rocks into 22 ft. of water. The coal is conveyed from the mines in trucks on horse tramways over the pier. This position is slightly protected from the southward by a reef of rocks, dry at low water, running out E.S.E. 1½ cable from Waniora Point.

Bellambi Bay is 1 mile South from Waniora Point, in lat. 34° 22′ S., long. 150° 57′ E., or 25 miles S.S.W. of Botany Bay, extending from Bellambi Point N.W. by N. ½ N. 1¼ mile to a point with a ledge of rock projecting about a cable's length from it, and is one-third of a mile deep. The southern shore consists, like Bellambi Point, of rock with a sandy surface, extending from the point half a mile in a W. by N. direction to a small creek close behind it. From 150 yards northward to one-third of a mile north-westward of Bellambi Point there is 3 to 6 fathoms water, from which the depth decreases somewhat irregularly to 2 fathoms within 100 yards of the shore, in a little bight extending a quarter of a mile westward from Bellambi Point, and forming the sea frontage of Bellambi village. In the eastern corner of this bight is a jetty 500 ft. long. Moorings have been laid down off the jetty, lying S.E. and N.W. from each other, in 5 to 6 fathoms; mooring bridles with *red* buoys are attached.

Bellambi Great Reef, which always breaks, extends nearly E. by S. half a mile from the East side of Bellambi Point, and has a rock lying S.E. by E. 4 cables from the point.

From a vessel bound to Bellambi Bay from the southward, will be seen to the northward of the northernmost Hat Peak a broken point in the mountain range, named Coorimal or Broken Nose, which being brought to bear W.S.W. will lead into the bay clear of the reefs.

Vessels from the *northward* proceeding to Bellambi Bay, from 4 miles off Hacking Head, in lat. 34° 4′ 45″ S., long. 151° 11′ E., should steer S.W. by S. until a white sandy point, forming the East extreme of the bay, is seen ahead. While steering for this point, an iron-roofed store will show the jetty, which being got to bear S.S.W., and steered for on that bearing, will lead to the moorings.

Vessels drawing 10 ft., or according to the tide, more water, can take in their cargoes under the *coal staith* from the railway trucks at the end of the jetty. A tramway, 3 miles long, leads to the mines, where a clear dry superior steam coal is worked in a seam 9 ft. thick.

WOLLONGONG HARBOUR, 4 miles southward of Bellambi Bay, is the southern bight of a bay extending N.W. ¼ N. nearly two-thirds of a mile to a ledge of rock which borders the sandy shore for about 2 cables' lengths farther to the northward. The only detached danger in Wollongong Bay is said to be *Para Reef*, with 12 ft. on it, lying nearly E.S.E. 2 cables from the N.W. point of the bay.

The harbour has been greatly improved by the construction of a breakwater, the Belmore Basin, and the enlargement and deepening of the old basin. The area of both is about 3 acres, 12 to 15 ft. deep, and wharfage accommodation 1,700 ft.; the breakwater is 450 ft. in length. The coral staiths, at which the depth is 18 ft., are connected with the mines by tramways. The harbour is being enlarged. The town is well built, and prettily situated; next to Newcastle it is the most important town on the coast, and contained (in 1882) a population of about 1,650 persons. In the first six months of 1883, 133,234 tons of coal were exported.

A *fixed bright* light, visible when bearing between S.S.W. and W. by N. ½ N., is exhibited at 56 ft. above high water, on the extremity of the breakwater at Wollongong. Vessels making Wollongong must sight the light, and then stand in towards it. When the port is neared, in rounding the breakwater, the light will be lost sight of, and will be again seen as a guide into the basin. When it is dangerous to enter a *green* light is shown in the lower part of the N.E. side of the tower.

KIAMA HARBOUR, now of increasing importance as a coal port, is a little cove, sheltered from the southward and eastward by a peninsula, which, together with the rocky shelf about it, extends 4 cables in an E. by N. direction from the mainland. It is 2 cables broad, and rises at the centre to a hill about 41 ft. high, with a flagstaff on it, close to which is "the Blow-hole," a hole in the rock, through which the sea passes in rough weather. There are two detached rocks above water, near the South side, and one close to the North point of the peninsula; the latter lying N. by W. ¾ W. 250 yards from the flagstaff. From this rock the entrance of the harbour extends N.W. by W. 3 cables, and has deep water.

At about 150 yards south-westward of the rock which forms the S.E. point of the entrance, a shoal runs out in a N.W. direction to 11 ft. water. In 1864, works were in course of construction on this shoal to project from the shore N.W. 150 yards into 23 ft. water, and W. by S. ¾ S. about the same distance into 16 ft. water, and forming between their outer ends an open space, 130 yards long, and 60 yards deep, having 21 to 10 ft. water. But the most secure part of Kiama Harbour is an artificial basin formed between the south-western of these, and other works projecting nearly 100 yards in a N. by W. direction from a jetty at 2 cables W. ¼ S. from the flagstaff; the basin thus formed being 140 yards long, and 80 yards deep, with a depth of 14 and 15 ft. across

its entrance. A *fixed green* light is exhibited from near the extremity of the breakwater.

Kiama is steadily becoming a place of importance, and has a population of about 1,200 persons in the town, or 5,835 in the whole district.

During bad weather vessels should keep outside *Shoalhaven Bight*, which extends from Beecroft Head to Black Point, 13 miles apart, as heavy tide rips exist. *Shoalhaven Rivers*, between which and Sydney there is communication by steamers, three times a week, are separated from each other by Comerong Island. Both the rivers have shallow bars. A *fixed red light* is shown on the North entrance point.

JERVIS BAY is bounded to the North by Point Perpendicular, formed of high cliffs, with a flat summit, without tree or shrub, in lat. 35° 5′ 45″, long. 150° 50′. The entrance is between this and Governor Head, and is 2 miles wide.

Bowen Isle, which forms the S.W. point of the entrance of Jervis Bay, lies close off Governor Head, from which it is only separated by a breach not much more than a cable's length across. This isle, for situation, soil, scenery, and fresh water, seems the most desirable spot in Jervis Bay; it is moderately wooded, and has much clear ground, covered only with long grass.

Darling Road is the southern part of a bay 2 miles deep, which from the North extreme of Bowen Isle extends N.W. by W. ½ W. 4¼ miles to Plantation Point. Some sunken rocks lie close to the extremity of the point and near the shore immediately to the southward of it. Darling Road affords very good shelter from S.E. winds, it being quite landlocked, as a vessel may anchor so far in as to have Bowen Isle in one with Perpendicular Point.

Montagu Road, which affords the most secure anchorage after Darling Road, in Jervis Bay, extends from Dart Point N. by W. 1½ mile to Montagu Point, and is 1 mile deep. At nine-tenths of a mile northward of Dart Point is a very small inlet, between which and Calvers Dock, nearly two-thirds of a mile farther to the northward, is a little bay, having 4½ and 3 fathoms water at about 2 cables from the shore.

Calvers Dock is a small inlet about 80 yards long, and 15 to 20 yards wide, with 5 ft. at low water; it is a dock already half-formed, and with little labour might be improved into a very convenient one.

Vessels bound to Montagu Roads should steer in mid-channel between Bowen Island on the South shore and Longnose Point, till Green Point is seen well open of the next bluff northward of Dart Point, before keeping away for the anchorage.

LIGHTHOUSE.—From Governor Head a cliffy coast, with 27 to 29 fathoms at 1 mile from the shore, winds South 2¾ miles to Cape St. George. Midway between the cape and the head is a steep cliffy projection, on which stands the lighthouse, a white tower, 61 ft. high, exhibiting at an elevation of 224 feet above the sea a *bright*, *red*, and *green* light, alternating every half minute. The *bright* light is visible 18 miles, and the *red* and *green* 14 miles. When

8 miles distant, on approaching this light from the southward, it must not be brought to bear to the northward of N. by W.; from the northward the light opens of Crocodile Head on a S.W. by S. ½ S. bearing.

Cape St. George is the best landfall to make on this coast, particularly in thick or hazy weather, when ships are uncertain of their latitude, it being no more than 80 miles from Port Jackson. There is a telegraph station at the cape, whence vessels can be reported to Sydney.

Ulladulla Harbour, is well protected by high land, with a sufficient depth of water for large vessels. A commodious pier, 200 ft. long, with a rubble stone approach, affords ample facilities for the loading and discharge of vessels of large tonnage. The population of the town and district is about 1,800. The S.E. point of the outer entrance of Ulladulla Harbour is a rocky projection of the coast, with breakers extending to the northward from it. A detached rocky patch, on which the sea also breaks, lies N.E. a quarter of a mile from the point. This harbour is 4 cables wide, N.W. and S.E., between the rocky shelf which projects 100 yards from the S.E. point, and the detached rocks which extend nearly the same distance from the N.W. point of the entrance. From the middle of the entrance, Ulladulla Harbour trends West half a mile, and is one-third of a mile wide, except at its western end, where a sandy bay forms the *Inner Harbour*, which extends N. by W. ½ W. 2 cables' lengths, is 1 cable deep, and protected by a pier extending from the southern entrance point.

Light.—A *fixed green* light, elevated 43 ft., is exhibited from a lighthouse on the pier at Ulladulla Harbour, visible 7 miles when bearing between S.W. ¼ W. and W. by N. ¼ N. Its approximate position is lat. 35° 21½′ S., long. 150° 30′ E.

Vessels bound to Ulladulla from the northward will, in clear weather, sight the light on a south-westerly bearing before losing sight of Cape St. George light. Vessels from the southward will have to keep an offing until the light opens out clear of the land. To enter the port, steer about W.S.W. for the light, keeping a good look-out to avoid Sullivan Reef, which generally breaks, and should be passed at a distance of 2 cables on its North side.

Bateman Bay extends from the South head, N. by E. ¼ E. 4½ miles to the North head, and runs in W.N.W. 3¼ miles from *Tollgate Islets*, in the middle of the entrance, to the bar of Clyde River.

Black Rock, which lies N. by E. ½ E. 1 mile from the South head, is about 1 cable's length in extent, with 6 to 10 fathoms water close round it. Between this rock and Tollgate Islets there is a channel 1¼ mile wide, having 10 to 15 fathoms water, on a sandy bottom.

The S.W. shore of Bateman Bay, from the South head, extends N.N.W. 1¼ mile, and from thence N.W. by N. 2¾ miles, to *Observation Head*, which lies in lat. 35° 43′ 55″ S., long. 150° 13′ 30″ E.

Vessels approaching Bateman Bay from the southward, should be careful to give Burrewerra Point a good berth, and not haul into the bay until Black Rock bears W.S.W., as there are dangerous rollers along the coast from the point to the rock. From about half a mile North of Black Rock, steer N.W. ¼ N. for Square Head, keeping in mid-channel between Black Rock and Tollgate Islets. There is anchorage N.W. of Tollgate Islets.

Cape Dromedary is in lat. 36° 18′, and has a double mountain, 2,700 ft. high, over it, which Cook thence called Mount Dromedary, and may be seen 60 miles distant. At 6 miles to the eastward is *Montagu Island*, 1 mile long, with an anchorage to the West.

LIGHTHOUSE.—On the summit of Montagu Island is a lighthouse, showing a *fixed* and *flashing bright* light, elevated 250 ft. above high water, and visible 20 miles. The light is *fixed* for 30 seconds, followed by a *flash* with an eclipse of about 13 seconds before and after it. Lat. 36° 15′ 20″ S., long. 150° 14′ 30″ E.

TWOFOLD BAY is a place of some interest, as a town, *Boyd*, was founded here by the unfortunate Mr. Boyd. On Toraraga Point is a landmark, called the Wanderer's Tower, now partly in ruins, which may easily be seen 15 miles off, and points out the position. It may be known, when coming from the southward, by Mount Imlay, and when nearer the bay, by the land behind it, consisting more of hillocks than elsewhere.

The entrance of Twofold Bay is 3 miles wide from Red Point N. by W. ¾ W. to Worang Point, close off which lie the Mewstone and another rock above water.

Eden township, on the North shore of Twofold Bay, sprang into existence in 1865; with the collapse of the gold fields it has, however, decreased in importance. There is a good pier, and the harbour is of great service as a port of refuge. Pilots can be obtained.

Lighthouse.—Twofold Bay is divided into two bights by *Lookout Point*, a rocky peninsula one-third of a mile broad, projecting nearly half a mile to the south-eastward, and having on its South extremity a white wooden lighthouse, 45 ft. high, exhibiting a *fixed red* light, at an elevation of 125 ft. above the sea, and visible 7 miles; it stands in lat. 37° 4′ 30″ S., long. 149° 55′ 30″ E., and is visible from seaward, when bearing between N.W. by W. ½ W. and S.W. ½ S.

East Boyd Bay, which appears to afford the most sheltered anchorage for large vessels on the South side of Twofold Bay, extends from Munganoo Point S.W. nearly 1 mile to Brierly Point, and is half a mile deep. East Boyd is a whaling station, on the East side of this bay, at about one-third of a mile southward of Munganoo Point.

Between Whale Spit and the mouth of Morrounkal Creek, at W. by N. ½ N. about 1 mile from the ruins of the tower, is a sandy bay, half a mile deep, close behind which is the township of *Boyd*, with its little church on the

rising ground. Jetties project a short distance from the shore between the ruined tower and the church, but are only accessible to boats.

Twofold Bay is so open to seaward, and is so free from detached dangers, that there is very little difficulty in entering it. On approaching the bay care should be taken to avoid the sunken rocks which lie nearly one-third of a mile to the northward of Red Point, and having distinctly made out the lighthouse and other objects, the ruins of the tower on the East side of West Boyd kept on a S.W. by W. bearing will lead in through the middle of the bay, when a vessel may anchor either in Snug Cove off the township of Eden, or in either of the anchorages in East or West Boyd, according to the prevailing wind, or as most convenient.

Custom-house.—Twofold Bay was formerly a place of considerable importance; but the principal port of outlet for the trade of the Maneroo district is now at *Merimbula*, a small port 12 miles to the northward. A custom-house has been established at Twofold Bay, and the usual regulations must be observed, and the rates paid as at other ports of entry and discharge in the colony, should a vessel break bulk or land passengers.

Disaster Bay, about 8 miles southward of Twofold Bay, is 5 miles wide at its entrance, and 3 or 4 miles deep. Anchorage may be obtained in 13 to 17 fathoms near the northern shore in N.E. winds. *Green Cape*, its northern point, is low and projecting.

LIGHTHOUSE.—On the extremity of Green Cape is a lighthouse, 68 ft. high, with a light showing a *bright flash* every minute, elevated 144 ft., and visible 19 miles seaward, between N.W. by N. $\frac{3}{4}$ N. and S. $\frac{1}{2}$ W.

CAPE HOWE is the S.E. extremity of Australia, and the North side of the entrance to Bass Strait. It is a low point, composed of stones and sand, covered with thick scrub, running to the westward, almost level for $3\frac{1}{2}$ miles, to the foot of Howe Hill and the chain of mountains of which it is the southern fall. The cape is steep-to, 14 fathoms being found within half a mile, but about 1 mile S.S.W. from it there is a sunken ledge of rocks running out from a projecting sandy point on the shore, which has been seen to break half a mile off in bad weather. *Howe Hill* is conspicuous, rising abruptly from the adjacent lowland to a height of 1,300 ft., its southern aspect especially exhibiting a steep fall.

GABO ISLAND (probably a native corruption of Cape Howe), a small island, lying S.W. $\frac{3}{4}$ S., $5\frac{1}{2}$ miles from Cape Howe, is $1\frac{1}{2}$ mile long N.W. by N. and S.E. by S. About the centre are a few sand-hills, rising to a height of 171 feet, partially covered with stunted scrub, on one of which the wooden structure of the old lighthouse still remains.

The LIGHTHOUSE, situated on the South extreme of the island, about 100 yards from high water, in lat. 37° 34′ 20″ S., long. 149° 55′ 45″ E., is a fine building of red granite, 156 ft. high, and exhibits a *fixed bright* light, elevated 179 ft., and visible 20 miles. It is shaded over Cape Howe, and the dangers

lying off it, or westward of a N.E. by N. bearing. There is telegraphic communication between Gabo Island and the mainland.

On the N.W. side of the island is a small sandy bay, where one coasting vessel will find anchorage and good shelter in N.E. and easterly winds; in the centre of this bay, about 5 fathoms, sandy bottom, will be found.

To the eastward of the island, close in, good shelter is afforded during the winter months from West and S.W. winds, half a mile off shore, in from 10 to 16 fathoms; all dangers are visible.

BASS STRAIT.

BASS STRAIT, separating Australia from Tasmania, was discovered by the surgeon of that name, of H.M.S. *Reliance*, in 1798. On the South side is a group of islands, of which Flinders or Great Island is the principal. To the N.W. of this is a small cluster, the *Kent Group;* on the eastern of which, *Deal Island*, is an excellent and conspicuous lighthouse, showing a *bright* light, 950 ft. above the sea, *revolving* once in 1 minute and 40 seconds, and has been seen 37 miles off, but being so elevated, it is frequently obscured by fogs.

The northern side of the strait is well marked by night, by Cliffy Island light (page 1036), and a *fixed bright* light, elevated 342 ft., and visible 24 miles, on the South extreme of Wilson Promontory The channel between the Kent Group and Wilson Promontory has several islands and dangerous rocks in it.

To the southward of the Kent Group is another channel, which also requires caution, as there are two reefs between them and the North end of Flinders or Great Island. They are the Beagle Reef, just awash, 3 miles East of the Endeavour Reef, and in a line with it and Wright Rock. The latter is 2½ miles from Wright Rock. These and a sunken rock, about a mile E.N.E. of Craggy Island, constitute the chief dangers in this channel. The extremes are marked to the North and South by Wright Rock and Craggy Island, between which ships should not pass, although there is a channel close to the South side of the former.

Wright Rock, 200 ft. high, is small and very conspicuous. Craggy Island is small and cliffy, but free from danger.

Banks Strait lies to the South of the Flinders Island Group. By night its navigation is facilitated by the *revolving light* on Swan Island (see page 1031). The *fixed bright light* on Goose Island, the westernmost of the Chappell Islands, marks the N.W. entrance, and is visible 14 miles. A light is also proposed to be established on Eddystone Point, the N.E. cape of Tasmania (see page 1031). In the narrowest part of the strait the tide runs 3 knots at

springs, and with westerly winds the ebb sometimes runs at 5 or 6 knots to the eastward.

The recent survey, in 1874-7, by Staff-Commander Stanley, R.N., has proved the existence of many dangerous rocks; the navigation of Banks Strait consequently requires great care.

The winds are commonly favourable for making a passage to the westward, through Bass Strait, and along the South coast, in the months of January, February, and March. To those who may be desirous of doing the same, the following observations by Capt. Flinders may be acceptable:—The first remark is, that the three months when this passage is most easy to be made, are precisely those in which it is unsafe, if not impracticable, to go through Torres Strait; and the second, that it will generally be of no avail for a ship to be in Bass Strait before the middle of December, and if it be the middle of January it will be preferable.

Ships coming from Port Jackson, or anywhere from the north-eastward, may take a departure from Cape Howe; but from about 30 miles to the eastward of the cape they should not steer a course more westerly than S.S.W., until in lat. 39° 30′ S.; on account of the danger to be apprehended from S.E. winds upon the Long Beach. Having reached 39° 30′, steer about W. by S., leaving the Sisters, the Craggy Islet, and Wright Rock on the port hand, or to the southward. Deal, the easternmost island of Kent Group, marked by the lighthouse before mentioned, which is in 39° 29′ S., 147° 22′ E., and may be seen 30 or perhaps 36 miles from the deck in fine weather, will come in sight ahead; and in passing 3 or 4 miles off its South side, the other islands of the group will be seen, and are to be passed in the same way; as are Curtis Island and the Sugar-loaf Rocks, which will then be in sight. From the Sugar-loaf to the North end of King Island, with its *fixed bright light* at night, the course is W. by S., 124 miles, with nothing in the way; but it is better to steer 15 or 20 miles to the northward of King Island, if the winds permit.

Currie Harbour, on the West coast of King Island, is only adapted for small craft. On the South side of the harbour is an iron lighthouse, 70 ft. high, the *light* showing *five flashes* in every minute, elevated 150 ft., and visible 17 miles. The light will illuminate an arc of 180°, or from New Year Islands on the North, to Cataraque Point on the South. Lat. 39° 56′ 45″ S., long. 143° 51′ E. Cape Otway *light* is described hereafter.

In case of foul winds, which, if the weather be thick or rainy, may be expected to fix at S.W. and blow strong, there are many places where a ship may anchor, to await a change; but the following appear to be the most convenient:—1st. West Cove in Erith Island, one of the Kent Group. 2nd. Hamilton Road, at the East end of Preservation Island, between Swan Island and Goose Island lighthouses. 3rd. On the South side of the largest Swan Island (with its lighthouse) for small vessels, or under Waterhouse Island, to

the westward. 4th. Port Dalrymple. 5th. Port Sorel, but it is accessible only to small vessels. 6th. Various places among the Hunter Group. 7th. Sea Elephant Bay, on the East side of King Island, where there is fresh water; or under the N.E. end of that island, if the wind be from S.W. 8th. Western Port, under Grant Island; anchoring so soon as the ship is sheltered. A fair wind for going onward through the Strait will take a ship out of this port. 9th. Port Phillip.

Ships bound to Bass Strait from the westward now generally keep in about 42° or 43° S. latitude until the meridian of 138° E. longitude is reached; they then haul up about N.E. or N.E. by N. to make Moonlight Head; this course intersects the parallel of 40° S. at about 120 miles West of King Island.

During strong westerly winds it is advisable to maintain the 40th parallel after passing the meridian of Cape Leeuwin, and with a view of giving King Island a wider berth, to haul up for Moonlight Head on reaching the meridian of 135° E. Several vessels have been wrecked on King Island by steering a direct course for Cape Otway, undue weight having been given to the dangers on the South coast of Australia and the much greater dangers on King Island apparently neglected. It is strongly recommended, therefore, that Moonlight Head, or some point on the coast even more to the westward, should be made, as the soundings on this part of the coast are well defined and regular. The 100-fathoms line of soundings is 35 miles to the south-westward of Moonlight Head, and the depth of 40 fathoms will be found at 10 miles from that headland. When approaching Bass Strait in thick weather, or when the navigator is uncertain of the vessel's position, the soundings should not be reduced to less than 40 fathoms.

Commanders of iron ships, especially of those newly built, are cautioned as to the necessity of ascertaining the errors of their compasses on approaching the Australian coast.

The current, generally running to the eastward, on account of the prevailing westerly winds, and appearing to follow the configuration of the coast line, will be found setting to the south-eastward out of the Great Australian bight, and should a N.W. gale be experienced on approaching the land, its strength may be accelerated to 2½ knots per hour. H.M.S. *Challenger*, in 1866, was thus set to the southward 30 miles in 24 hours.

Near the shore, with easterly winds, a current has been found setting to the westward, but this current is probably confined to the vicinity of the coast.

Northerly or N.N.E. winds are, as a general rule, followed by a change to West and S.W. winds.

Vessels proceeding from the neighbourhood of King Island will find the tidal stream against them, of longer duration than the stream in their favour.—*Staff-Commander Stanley*, 1878.

In addition to the foregoing directions, it is only necessary to remark, that the very variable weather and sudden changes of wind which are met with in

this strait, render caution necessary, both in taking up any anchorage that is not well sheltered, and in quitting it so soon as the wind blows in from seaward; but, in other respects, Bass Strait may be used without more than common risk, by the exercise of ordinary care and prudence.

The ISLAND of TASMANIA is nearly equal in size to Ireland, being 170 miles in length and 160 miles in breadth. It was first discovered by Tasman, in 1642, who named the island Van Diemen's Land, after the governor-general of the Dutch East Indies. The change of name to Tasmania took place in 1856, in reply to an address from the legislative council, which stated that the name was generally in use, and preferred by the colonists.

The population of Tasmania, by the census taken in 1881, was 115,705; in 1870 it was 99,328, and of the aboriginal population there was only one person living, a female, who died in 1876. The exports, in 1882, mostly wool and farm produce, were valued at £1,587,389, and imports at £1,670,872. Gold, tin, bismuth, and other metals are found, and also several seams of coal, in various parts of the country. There is electric communication with Australia.

The North coast of Tasmania forms the South side of Bass Strait, and lies generally in very smooth water, the prevailing winds being off the land. Its navigation is represented to be free from dangers to within about a mile of the shore and of the islands which lie off it, except in the neighbourhood of Port Dalrymple.

Eddystone Point, on which it is proposed to erect a lighthouse, is the N.E. extreme of Tasmania, in lat. 40° 59′ S., long. 148° 20′ E. It projects about a mile from the line of coast, and is enclosed by dry and sunken rocks, some of which lie a mile off the point.

Swan Island Lighthouse.—On the N.E. extreme of the largest Swan Isle, in lat. 40° 43′ 30″ S., long. 148° 6′ 30″ E., stands a round tower, 74 ft. high, the upper part painted red, and the lower white; it exhibits a *bright* light, *revolving* every minute, elevated 100 ft. above the level of the sea, and visible 15 miles.

There is tolerable anchorage on the S.E. side of the largest Swan Isle, in 6 or 7 fathoms, at about a quarter of a mile off the South point of a sandy bay, where vessels may wait for tide, or a short time with N.W. winds; but there is better anchorage off the mouth of Little Mussel River to the southward, where a vessel can more easily get under way in S.E. or easterly winds.

Salamander Rock, with 10 ft. water over it, discovered in 1876, lies E. by S. ½ S., 12½ miles from Swan Island lighthouse. *Harry Rock*, with 16 ft. over it, lies N.W. by W. ½ W., 3 miles from the lighthouse.

PORT DALRYMPLE, the principal harbour on the North coast of Tasmania, forms the entrance of *Tamar River*, which flows through a valley between two irregular chains of hills which, when seen from directly off the entrance, appear as two clusters of hills having some resemblance to each other; and in fine

weather, the distant blue heads of the back mountains will be seen over the tops of both clusters. These appearances, together with the position of the vessel, are the best distant marks for finding Port Dalrymple.

Coming alongshore from the eastward, Ninth Islet, and afterward Stony Head, with Tenth Islet lying off it, will show the vicinity of the port; and *Low Head*, with the conspicuous red and white lighthouse on it, will be perceived in the bight to the S.S.W. It exhibits a *bright light, revolving* once in every minute, elevated 142 ft., and visible 15 miles.

The entrance of Port Dalrymple, between Low Head and Friend Point, which lies S. by W. $\frac{3}{4}$ W. $1\frac{3}{4}$ mile from the head, is difficult of access, on account of the numerous reefs and banks in it, which extend a considerable distance from the western side of the entrance; strangers should therefore avoid that side, and endeavour to enter by Low Head. The greater part of these shoals, and also of those within, are covered at half tide, so that with the flood, or even a little before, is the best time to enter Port Dalrymple, as almost the whole of the dangers are then visible.

The centre of *Hebe Reef*, the outermost danger off the entrance, lies West $2\frac{1}{3}$ miles from Low Head lighthouse.

Middle Ground, the most formidable shoal in the entrance of Port Dalrymple, is a rocky patch, between W. by S. and S.W., $6\frac{1}{2}$ and 4 cables' lengths from the lighthouse, with, according to report, only 9 ft. on one spot at low water springs, but the least depth found on it by the *Beagle* was 12 ft. The northern extremity of Low Head in one with the first black cliffy projection to the eastward of it, or the flagstaff on Low Head open to the northward of the lighthouse, clears the northern edge of it, and its S.W. edge is marked by a *black* buoy, bearing S.W. $\frac{1}{2}$ W., distant 6 cables from the lighthouse.

East Channel, which lies between the Middle Ground and the shoal which borders the West side of Low Head, is one-third of a mile wide in the outer part. It is not safe for a stranger to enter without a pilot.

West Channel, the main entrance into Port Dalrymple, is formed by the Middle Ground on the N.E., and Yellow Reef on the S.W. side, and is nearly 2 cables wide, with depths of 22 to 10 fathoms.

On *She-oak Point*, East side of Tamar River entrance, two *fixed bright* leading lights are shown, 409 yards apart, and visible 9 miles, which in line S.E. by E. $\frac{1}{2}$ E. lead through the West Channel. The upper light, elevated 55 ft., is shown between S.S.E. and N.W. $\frac{1}{2}$ W., through South and West, and the lower light, elevated 38 ft., between S. $\frac{1}{2}$ E. and N.W. $\frac{1}{4}$ W.

A vessel bound for Port Dalrymple or Tamar River is recommended, especially if a stranger, to use the West, and safer, channel; and, having approached within 6 miles of the entrance, should bring the lighthouse on Low Head to bear E. by S. until the two white towers on Lagoon Beach are plainly visible; then bring them in line E.S.E., and, keeping them so, steer boldly in. When

passing Hebe Reef, take care not to open the inner or S.E. tower to the right, or southward of the outer tower.

The two towers in line will lead 3 cables north-eastward of Hebe Reef, and through the West Channel, midway between the *white* buoy of Yellow Reef on the starboard, and the *black* buoy of the Middle Ground on the port hand. Having cleared the West Channel, proceed under easy sail for good anchorage in 6 or 8 fathoms, abreast of Lagoon Beach, taking care to avoid the spit which projects from Barrel Rock beacon, and, if a vessel of great draught, the 3-fathoms bank immediately to the southward of it.

The shoals on either side within the entrance of Tamar River are marked with beacons and buoys: the beacons on the western shore are marked thus ◁, and those on the eastern side, with a cross †. Shoals or rocks, marked with *chequered* buoys, may be passed on either side: a *red* or *black* buoy signifies that the danger extends from the eastern shore, and a *white* buoy that it extends from the western shore.

Pilots may always be obtained off Port Dalrymple, when the weather will admit of their going off; and should the weather be too bad for this purpose, the boat will be lying in mid-channel, with the flag flying.

LAUNCESTON, the second town in Tasmania, with a population of about 17,000 in 1883, is situated at the head of Tamar River, which, following the winding course of the river, is 55 miles from the sea. Large vessels are prevented from approaching close to the town by a bar, upon which there is generally about 14 ft. at high water. Vessels of 17 or 18 ft. draught can go within half a mile of the town, below the bar. *A steam tug*, maintained by the Marine Board, is available for towing vessels, at moderate rates; the signal for the tug is the rendezvous, or chequered flag, hoisted where best seen. There is a floating dock at Launceston, capable of receiving vessels of 500 tons. A railway, 133 miles long, connects Launceston with Hobart.

DERWENT RIVER.—There are two approaches to Derwent River, that from the S.W., through D'Entrecasteaux Channel, and the other by Storm Bay, between the northern part of Bruny Island and Tasman Peninsula, at about 12 miles to the eastward of it; but the latter approach is much to be preferred, experience having taught the local traders that though apparently time and smooth water would be gained by going through D'Entrecasteaux Channel, still, in consequence of the violent squalls, which suddenly rush down the hills, preventing vessels from carrying sail, much time is actually lost; so that in all cases the better passage to Derwent River is through Storm Bay, eastward of Bruny Island.

LIGHT.—On *Bruny Cape*, the S.W. point of Bruny Island, and on the East side of the entrance to D'Entrecasteaux Channel, is a white lighthouse, 44 ft. high, showing a *bright* light, *revolving* in 1 minute and 40 seconds, elevated

335 ft., and visible 22 miles. At 10 miles distant it appears bright for 50 seconds, and eclipsed for 50 seconds.

Vessels from the westward bound into Derwent River through Storm Bay, should give Tasman Head, the South point of Bruny Island, a good berth, to avoid Friar Rocks. In proceeding northward past Fluted Cape, the most remarkable object will be *Mount Wellington*, which resembles Table Mountain at the Cape of Good Hope; and in advancing up the bay, Betsy Isle, which is high and wooded, will soon appear, when steer so as to pass on the West side of *Iron Pot lighthouse*, painted red, and showing a *fixed bright* light, elevated 65 ft., and visible 10 miles. In approaching the Derwent, the generally strong prevailing westerly winds make it desirable to keep within a mile of Bruny Island.

Having entered Derwent River between Cape Delasorte and Iron Pot lighthouse, keep the western shore aboard, steering N. by W. ¼ W. and N. by E. up to a quarter of a mile off One Tree Point, after passing which steer N.W. for Sullivan Cove, the usual anchorage off Hobart, where vessels may come to as most convenient; but one anchor should be laid out well to the S.E. for the convenience of getting under way. A *fixed red* light, visible 3 miles, is shown on Battery Point, S.E. side of entrance to Sullivan Cove. From the middle of the entrance the cove extends W. by S. a little more than 2 cables' lengths to the Melbourne and Sydney Steamship pier, on which is a *red* light for steamers. *Green* lights are shown on Argyle Street and Franklin Street wharves. There is no danger all the way up, so that vessels may work in or out without a pilot, tacking at about a quarter of a mile off shore, and may anchor anywhere, on muddy bottom.

HOBART,* the capital of Tasmania, is picturesquely situated at the foot of Mount Wellington, on the River Derwent, about 12 miles from its mouth. The harbour is easy of access, as above described, well sheltered, and with sufficient depth of water for vessels of the largest tonnage; there is ample wharf and dock accommodation for the loading, discharge, and repairs of ships. The city proper forms nearly a square, and is built on a succession of hills. It had a population of 27,265 persons in 1882.

It is connected with Launceston by railway, and there is a fortnightly steam communication to Melbourne and Sydney, and numerous small steamers ply to different spots of the Derwent. Hobart is largely visited during the summer season by visitors from Melbourne, Adelaide, and Sydney, on account of the reinvigorating climate. The wharf and warehouse capacity is of a superior character. The former military barracks are on the South side, on the summit of a hill, and are occupied by schools and private families, there being no soldiers in the colony.

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* By an Act, passed in 1880, the name of the capital was changed from Hobart *Town* to Hobart.

There are four first-class patent slips available for vessels of a considerable size.

Fort Mulgrave, or Prince Albert Battery, at which is a *signal-station*, is situated about 1 cable south-westward of the southern entrance point of Sullivan Cove, at an elevation of 85 ft. above the sea. The flagstaff at the signal-station is in lat. 42° 53′ 32″ S., long. 147° 21′ 24″ E.

It is high water in Derwent River, on full and change, at $8^h\ 15^m$; springs rise 4½ ft., and neaps 3½ ft. The tides are here exceedingly irregular, and frequently are for days almost stationary. The flood stream is barely perceptible between Iron Pot Islet and Kelly Point, but it runs stronger under Mount Louis, and from thence parallel to the shore; it then follows the course of the river at the rate of half a knot. Between Macquarie and Montagu Points the ebb runs South 1½ knot at half tide; off Battery Point it runs S. by E., sweeping south-eastward round Sandy Bay, at the rate of three-quarters of a knot, and after passing Sandy Point, its strength is gradually reduced to half a knot towards the entrance of the river.

Pilots for Derwent River may be obtained at Recherche Bay, in the southern entrance of D'Entrecasteaux Channel; also on Bruny Island, about 4 miles from Iron Pot lighthouse, and at the junction of D'Entrecasteaux Channel and Derwent River.

THE COAST OF VICTORIA.

PORT ALBERT, 170 miles S.W. by W. of Cape Howe, the Long Beach lying between, is in long. 146° 45′ E. The following information is extracted from Lieut. Henry J. Stanley's remarks made while surveying this coast in 1871.

The entrance to Port Albert is over a mile wide between the East point of La Trobe Island and Clonmel Island on the opposite side. But this entrance is divided by a large bank of sand, which extends from midway between these two islands for nearly 2 miles in a southerly direction, forming the Eastern and Western Channels on either side of it.

The population of Port Albert and the surrounding district is about 1,000. Its exports are wattle bark, leather, raw hides, and grain. There is telegraphic communication with the Australian colonies and Tasmania. A *lifeboat* is stationed at the town of Port Albert, 4 miles from the entrance.

The *light*, formerly shown from a white wooden building about three-quarters of a mile from the East point of La Trobe Island, was discontinued in 1881.

The *Bar* of Port Albert, which continually shifts, and is marked by two buoys, is, strictly speaking, only navigable for vessels drawing 9 ft. water. The surveying steamer *Pharos* crossed it, drawing 10½ ft., but it was the fine weather season, and it was intended to remain inside for a week. Vessels of

heavy draught would run the risk of being detained inside either for high tides or smooth water.

Pilots.—There is a pilot at the town of Port Albert, who can be communicated with by signal, there being a signal staff on the N.W. part of Clonmel Island. It will, however, be found difficult to make out the signals if to the southward, as the heavy break, especially during or after a strong breeze, causes a thick mist to ascend, which nearly hides the flagstaff, not very distinct at any time. No stranger can enter without a pilot.

The following *Tidal Signals* are at present in use, viz.:—A blue flag signifies 7 ft. on the bar; a black ball, 8 ft.; a red flag, 9 ft.; a white flag, 10 ft.; a white flag over a ball, 11 ft.; two balls, 12 ft.; a white flag under two balls, 13 feet.

A vessel bound to Port Albert from the westward should, after rounding Wilson Promontory, steer for Cape Wellington, after passing which keep Rodondo Island just open of it, until Mount Singapore is in line with Townsend Point W. ½ S., which will ensure a distance of a mile from the bar; or, in the event of Rodondo being obscured, Mount La Trobe, kept open South of Rabbit Island S.W. ¼ S., will lead rather more than a mile to the southeastward. By using either of these leading marks vessels may arrive within a mile of the bar, when they will be certain to observe the break, if not the buoys. Notice of their approach will then be signalled to the town, and the pilot will at once board the vessel. It must be borne in mind that as the shore of La Trobe Island is low, Townsend Point will not be visible off the bar, except from a height of about 15 feet.

From the eastward vessels may approach the shore to a distance of 3 miles, and if at that distance, and coasting to the southward, they will observe the break on the bar; or they may bring Mount La Trobe, the highest mountain on Wilson Promontory, in line with Rabbit Island S.W. ¼ S., and make out the bar from that line.

LIGHT.—About 13 miles southward of Port Albert entrance are *Seal* or *Direction Islands*, a group of four small islands, and three rocks. Notice was given in 1883 that a light would shortly be shown from a stone lighthouse, 24 ft. high, on the southern side of *Cliffy Island*, the easternmost of the group. The light will be *red*, showing *five flashes* every minute, elevated 180 ft., and visible 15 miles. Lat. 38° 57′ 10″ S., long. 146° 42′ 20″ E.

Waratah Bay, north-eastward of Cape Liptrap, has good anchorage at more than a mile from the shore, during S.W. gales, with plenty of room to work out with easterly winds. Off Bell Point are three rocks called the *Bird Rocks*, a good guide for the bay, and on the shore, at 2 cables W.S.W. of them, a *fixed red light*, elevated 120 ft., and visible 3 miles, is shown from a lamp-post. At 7 cables N.E. of this light there is anchorage in 6 fathoms.

Cape Schanck and Light.—On the North side of Bass Strait, and 80 miles W. by N. ½ N. from the extremity of Wilson Promontory, is Cape Schanck,

on which stands a lighthouse, showing a *fixed bright* light, varied by a *flash* every 2 minutes, elevated 328 ft., and visible 23 miles, when bearing between W. ¼ N. and S.E. ¾ E. Within 6 miles the eclipses will scarcely be observable.

WESTERN PORT entrance is 10 miles eastward of Cape Schanck. It is quite clear and calls for no special remark here. Cape Schanck is the southern extremity of the peninsula which separates Western Port from Port Phillip, 16 miles to the north-westward.

On the outer end of Flinders jetty, two-thirds of a mile N.W. of the West head of Western Port, is a *fixed* light, showing *bright* between S.E. ½ S. and E. ½ S., and *red* northward of E. ½ S. Vessels must not anchor in the bright sector, to avoid fouling the telegraph cable.

PORT PHILLIP, which includes the ports of Melbourne, the metropolis of the colony of Victoria, and of Geelong, is situated at the head of an extensive bight between Cape Otway and Wilson Promontory, 130 miles to the eastward of the cape. In approaching the port from the westward, the entrance is not easily distinguished until Nepean Point, the eastern entrance head, bears N.N.E., when Shortland Bluff, on which the highest and leading lighthouses are erected, shows out, and the estuary becomes visible. If Barwon Head is previously seen, the entrance to Port Phillip is easily found. A *Signal buoy* is moored in 12 fathoms, 1½ mile S.E. of Barwon Head.

Port Phillip extends about 32 miles, North and South, and is 18 miles wide, exclusive of an arm which trends 16 miles in a W.S.W. direction to Geelong, the port being capable of receiving and sheltering a large number of ships; but the entrance is less than 2 miles wide, and nearly one-half of it is occupied by rocks and shoals.

Point Lonsdale, the western head of the entrance to Port Phillip, is low, and juts out from a dark rocky cliff, it being neither so high nor so well marked in outline as Nepean Point, the eastern head; but can now be easily distinguished by a light and look-out house, a telegraph station, a tidal flagstaff, and a *red* beacon, near its S.E. extremity. *Lonsdale Reef*, the greater part of which dries at low water, projects a quarter of a mile south-eastward from Point Lonsdale, and is about 1 cable broad.

The Light on Point Lonsdale is fixed *green* or *red*, visible 10 miles; it is shown from a lighthouse, 54 ft. high, painted in red and white bands. The *green* light is visible from seaward when bearing between about N. by W. and N.W. ½ W., and the *red* towards Nepean Point, and the harbour, when bearing N.W. ½ W. to W. by S.; between W. by N. and W. by S. it is deepened to a darker *red*.

Vessels having the *green* light in sight will be outside, and with the *red* in sight, inside the Lonsdale and Lightning Rocks, which bear S.E. ½ E. distant respectively nearly two-thirds of a mile and 1¼ mile nearly from the light. The blending of the two colours, when seen from a vessel, will show that she is in

the vicinity of, or in line with these dangers; great caution will therefore be necessary *before* these colours begin to blend.

Pilots.—There is a most efficient pilot establishment at Port Phillip Heads. The vessels are fore-and-aft schooners and cutter-rigged, painted a light stone colour, each with her number on her main-sail. They cruize from 3 to 12 miles outside the heads, borrowing on either shore according to the weather; and one of them is constantly outside when there is a possibility of keeping the sea. They carry at the mainmast-head by day a *red* and *white* flag in horizontal stripes, and between sunset and sunrise exhibit a bright light at the foremast-head, and show in the waist a flash-light every 15 minutes. No stranger should attempt to enter without a pilot.

Tidal Signals are shown at Point Lonsdale, denoting the quarter of the tide with reference to the stream. In the middle of the entrance between Lonsdale and Nepean Points the period of slack water is very limited. The stream turns from 2 to 3 hours after high and low water by the shore.

The Flood, during the first quarter, is denoted by a blue flag half-mast.
" " second quarter " at mast-head.
" " third quarter " red flag half-mast.
" " fourth quarter " at mast-head.

Ebb.—The same signals are used for the four quarters of the ebb, with a ball below the flag.

Nepean Point, the eastern head of the entrance to Port Phillip, is the narrow western termination of a peninsula, which extends 15 miles in a westerly direction from Arthur's Seat, and consists of a series of sand hummocks slightly covered with low bushes, and having a *white* beacon on its extremity.

Nepean Reef projects West nearly 2 cables from Nepean Point to *Nepean Rock*, a small islet, on which is a *red* cone-shaped beacon; from thence a continuation of the reef and several pinnacle rocks outside it, extend $3\frac{1}{2}$ cables further westward to *Corsair Rock*, at 150 ft. N.N.E. of which is a small detached rock, with 10 ft. water on it. Nepean Reef dries at low water out to the islet, but the remainder of the reef is covered with 1 to 3 ft. water.

Corsair Rock, which may be considered as the outer end of Nepean Reef, is 20 ft. in diameter, having 8 ft. water over it, with 3, 4, and 5 fathoms close-to; this rock lies with the *red* beacon on the rocky islet in line with the *white* beacon on Nepean Point, bearing East, the *red* beacon distant $3\frac{1}{2}$ cables.

The Entrance to Port Phillip, between Lonsdale and Nepean Points, is $1\frac{3}{4}$ mile wide; but the navigable channel is contracted to a little less than 1 mile in width between the reefs that project from Lonsdale and Nepean Points. *Lonsdale* and *Lightning Rocks*, the former with 18 ft. least water over it, are the shoal heads of a rocky bank, extending in a S.E. by E. direction from Point Lonsdale, and stretching completely across the entrance. The channel between them is 4 cables wide.

In 1881, Lightning Rocks were blasted to a depth of 32 ft. at low water. The depths over the patches with 25 to 29 ft. on them, N.W. and S.E. of Lightning Rocks, have also been increased to 30 ft., and it is intended to continue these operations until the entrance is cleared of dangers.

Outside the bank there is 9 to 15, and inside 10 to 47 fathoms. This great inequality, with tide streams at times running 5 to 7 knots, causes the well-known Race, or "*Rip*," between Port Phillip Heads, which during, or immediately after, a south-westerly gale, breaks so furiously as to be dangerous to small vessels. Several rocks, some with only 24 ft. water on them, have been found by sweeping in the Race, and others may yet be discovered. As above stated these rocks are being removed by blasting.

Vessels drawing less than 14 ft. may, in the day time, pass between Lonsdale Reef and Rock, by keeping Swan Point just open East of Shortland Bluff, bearing N.E., northerly. Swan Beacon open of Shortland Bluff, bearing N.E. $\frac{1}{2}$ N., leads half a cable eastward of Lonsdale Rock.

The two lighthouses on Shortland Bluff in line, N.E. by N., lead in the *fairway* through the entrance into Port Phillip.

Lightning Rocks are cleared to the northward and southward by keeping Point Lonsdale mast open on either side of Port Lonsdale telegraph house, which is *white*, with a slate roof; and the *red* obelisk on Shortland Bluff touching the East side of the high lighthouse, bearing nearly N.E. by N., clears them to the westward.

Corsair Rock, off Nepean Point, is cleared by keeping the low lighthouse on Shortland Bluff in line with the East end of the light-keepers' houses, near the high lighthouse, N.E. by N. $\frac{3}{4}$ N., until the *white* beacon on Point Nepean is well open to the northward of the *red* beacon, when going in, or well open to the southward when going out.

On the shore, about $1\frac{1}{4}$ mile northward of Point Lonsdale, are two *beacons*, the outer painted *red*, and the inner *chequered black* and *white*. Vessels of heavy draught by keeping these beacons in line N.W. by N. $\frac{3}{4}$ N. will pass about midway between Lightning and Corsair Rocks, with not less than 7 fathoms at low water.

Shortland Bluff, on which are two lighthouses and a *red* obelisk, with the township of Queenscliff in their rear, is the S.E. extreme of a peninsula projecting nearly 2 miles in a north-easterly direction from the line of coast.

Lights.—The *high lighthouse* on Shortland Bluff, which bears N.E. $\frac{3}{4}$ E., distant $2\frac{1}{2}$ miles from Point Lonsdale, is a tower 81 ft. high, built of blue stone, which retains its natural colour. It exhibits a *fixed bright* light, 130 ft. above the sea level, and is visible from seaward, on any bearing between *about* E. by N. and North, at the distance of 17 miles, in clear weather; but when close in with Lonsdale land it will only be seen when bearing between N.E. by E. and North. Within Port Phillip heads the light will be visible when bearing from N.E. by E., round by North and West, to S.W. by W.

The *low lighthouse* tower, 69 ft. high and painted white, stands S.W. by S. 352 yards from the high lighthouse, and at the height of 90 ft. above high-water level, exhibits a *fixed red* and *bright* light, showing *bright* when bearing from about N.E. by E. to N.E., *red* from N.E. to N.N.E., and *bright* from N.N.E. round by North to W. by N. The *bright* light should be seen in clear weather at a distance of 14 miles, and the *red* at 10 miles.

Shortly after the destruction of Swan Spit lighthouse in 1881 (p. 1041), the low light was arranged to show a *red* sector between N.E. by E. ¼ E. and N.E. by E. ¾ E., or from No. 1 *black* buoy to *perch* buoy No. 2, at the entrance to West Channel, as a guide in the fairway from Swan Spit to between these buoys.

Vessels entering between Port Phillip heads should keep the *red* light in sight, and steer in with it bearing N.E. by N., in line with the high *bright* light. The change of colour from *red* to *bright* indicates an approach to Lonsdale Reef on the West, and Nepean Reef on the East side of the entrance.

The *bright* light between the bearings of N.E. by E. and N.E. shows over the dangers extending from Point Lonsdale. Between the bearings of N.N.E. and W. by N. the *bright* light shows over Corsair Rock to a line from the low lighthouse along the North side of, and through the South Channel, passing to the southward of Pope's Eye, and 1 cable northward of the *red* buoy, along the *black* buoys, and to the northward of the *white* buoys, which mark the North and South sides of the channel, so that vessels during the night, with light winds or adverse tide streams, will be aided by a bearing of the light.

At N.N.E. nearly half a mile from the high lighthouse, Queenscliff Jetty projects about 130 yards from the shore, and has a *fixed green* light at its end, visible at a distance of 4 miles; this is also a *life-boat* station.

Swan Island, which is low, is separated from the S.E. point of the Shortland Peninsula by a shallow opening 100 yards wide, communicating with Swan Bay to the westward. From this opening, the South side of Swan Island trends nearly E.N.E. 1⅓ mile, and from thence the eastern end sweeps three-quarters of a mile northward, round Swan Point, to the N.E. extreme of the island. *Swan Beacon*, which, when open of Shortland Bluff, leads clear of Lonsdale Rock, is *white* with a *red* top, and is situated near the S.E. extreme of the island, the high lighthouse on Shortland Bluff bearing nearly S.W. ¼ S., distant a little less than 2 miles.

To clear the edge of the bank off the island and the shoals on it, keep Lonsdale lighthouse open of Shortland Bluff.

Swan Spit Lighthouse is a wooden building, erected upon piles, on the S.E. edge of the shoal bank just noticed, and bears E.S.E., distant two-thirds of a mile from Swan beacon. It is painted *red*, and exhibits a *fixed red* or *bright* light, visible at the distance of 8 miles, showing *bright* when bearing from about E.N.E. to N.E. ½ E., *red* from N.E. ½ E. to N.E. ¾ N., *bright* from N.E. ¾ N. to N. by W. ½ W., and *red* from N. by W. ½ W. round by West

to S. ¼ W. The *red* light in sight between the bearings of N.E. ½ E. and N.E. ¾ N., indicates the entrance to the West Channel between No. 1 *black* buoy and the *white* perch buoy on the Royal George Shoal. When bearing between N.W. and S.W. by W. the *red* light appears deepened in colour.

On September 14th, 1881, the Swan Spit lighthouse was totally destroyed by collision, and a lightvessel, showing a fixed red light, visible 8 miles, was moored 1 cable E.N.E. of its site. As the lighthouse will probably be replaced, the above description is retained, with which the directions hereafter given correspond.

A gong is sounded every 10 minutes in thick or foggy weather.

The Western Shore of Port Phillip from the northern entrance point of Swan Bay extends nearly N. by E. 2¼ miles to South Red Bluff, and from thence about three-quarters of a mile farther in the same direction, to a point, close to the northward of which St. Leonard's Jetty projects into about 8 or 9 feet water, with a *green light* on its extremity. A continuation of the bank which stretches northward from Swan Island borders this shore, from which it projects 1 to 1½ cable, with 2 to 6 ft. water on it. The 3-fathoms edge of the shoal water, which extends about one-third of a mile from the shore, between the entrance of Swan Bay and the point of St. Leonard's, forms the northern portion of the West side of Coles Channel.

From the point of St. Leonard's the shore, after extending N. by W. ½ W. 1¼ mile to North Red Bluff, trends N.N.E. one third of a mile to *Indented Head*, from whence it recedes in a N.W. ½ N. direction 1¼ mile to *Point George*, close to the northward of which is White Woman Rock. From the point of St. Leonard's to Point George a shoal, with 2 to 3 ft. water on it, borders the shore, from which it extends about 1 to 1½ cable.

Governor Reef is a patch, with 1 foot water on it, marked by a beacon, from which North Red Cliff bears W. ½ N. distant nearly two-thirds of a mile. At about one-third of a mile to the north-westward of the beacon, and E.S.E. nearly a quarter of a mile from Indented Head, is another patch, which dries.

From half a mile off the point of St. Leonard's the 3-fathoms edge of the shoal water, which extends from the shore, trends in a N. by E. direction to two *black* buoys, which mark the edge of the bank, and lie respectively S.E. by E. and E.N.E., each distant half a mile from the beacon, just noticed. From the northern of these two buoys the eastern 3-fathoms edge of the bank extends irregularly, in a N. by W. direction 2½ miles to the N.E. extreme of *Prince George Bank;* at a quarter of a mile off which is moored a *black* buoy in 6 fathoms, bearing N.E. ¼ N., about 2¼ miles from Point George. There are two 4-ft. patches on the northern edge of the bank nearly in line with the *black* buoy, bearing E. by N. ¾ N., from which one patch is distant two-thirds of a mile, and the other 1½ mile.

The Southern Shore of Port Phillip from Point Nepean to Observatory

Point E. ¼ S. 1¼ mile, forms a bight a quarter of a mile deep; but the depth of water in it does not exceed 17 ft., and there are numerous sunken patches. The 3-fathoms edge of this shallow water and foul ground extends from the shore to a cable outside the line of the points of the bay.

There is a flagstaff on Observatory Point, which marks the western boundary of the sanitary station, and from this flagstaff the shore extends E. by S. ¾ S. nearly 1⅛ mile to another flagstaff at the eastern boundary of the station. A jetty projects from the shore at 4 cables West of the East flagstaff, and on its extremity a *green* light is shown. A *red* light is shown on the end of the pier at *Portsea.*

From the eastern flagstaff the shore trends in an E. ½ S. direction three-quarters of a mile to Point Franklin. On the East side of the flagstaff there is a small bight, from which a shoal spit projects one-third of a mile, but between the two flagstaffs the shore may be approached to 1 cable's length, in 7 and 8 fathoms, and between the shoal spit and Point King, within a quarter of a mile, in 6 and 7 fathoms. At *Sorrento* a *green* light is shown on the head of the jetty 1¼ mile southward of Point King.

The *Quarantine Ground* extends along the shore between Observatory Point and Point King, the anchorage being in 8 and 9 fathoms at three-quarters of a mile from the shore. Strangers who, through stress of weather, bring up here, or at the anchorage off Shortland Bluff, should not attempt to proceed above these anchorages without a pilot, as a collection of banks, with intricate channels, extends 8 miles in all directions above these anchorages.

Nicholson Knoll is a sand ridge near the Quarantine Ground, about a cable's length in extent, North and South, with 3 fathoms water over it, and 5, 6, and 7 fathoms close-to. It is marked by two *black* and *white* chequered buoys, moored on the extremities of the knoll.

Entrance Banks and Channels.—For the first 2½ miles within the heads the estuary is free from dangers, but above that distance, where it widens between North and East, it is crowded with sand-banks, radiating nearly 8 miles from their southern and western extremes. Between these banks there are several channels, three only being buoyed, namely the South, West, and Coles Channels; the others are narrow and intricate.

West Channel, which is most used, extends from Royal George Sand 5 miles in a N.N.E. direction, and is from 1 cable to half a mile wide, with 5 to nearly 3¼ and 5½ fathoms water, over an even bottom of sand and shells. This channel is distinguished by Swan Spit lighthouse, in the S.W., and by West Channel Pile light, in the N.E. entrance, the sides being marked by *white* buoys, with even numbers, on the S.E. side, and *black* buoys, with odd numbers, on the N.W. side.

The S.E. side of West Channel, after passing Royal George Sand, is formed by the S.W. extreme of West Middle Sand and the N.W. edge of William Sand.

West Channel Pile Light.—On the N.E. side of West Sand, at the northern entrance to West Channel, is a Pile lighthouse in 15 ft. water, showing a *fixed* light, elevated 31 ft., and visible 11 miles. Over West Channel, and to the eastward, between S.W. by S., where it cuts No. 5 buoy of the West Channel, and N. by W. ¼ W., where it cuts the black buoy off Prince George Bank, the light is *bright;* in other directions it is *red.* On the establishment of this pile light, in 1881, the lightvessel was withdrawn. Vessels should pass half a cable eastward of the lighthouse.

South Channel.—The South, or great ship channel, is bounded to the southward by the northern edge of the three banks in the entrance, along which are moored *white* buoys, marked with even numbers, and the Pile lighthouse. The channel is bounded on the North side by the southern edge of Great Sand and Middle Ground, defined by *black* buoys, marked with odd numbers, the first and last being each surmounted by a staff and ball.

South Channel Pile Light, at the eastern end of the channel, in the position formerly occupied by No. 10 buoy, is a *fixed* light, showing *red* when bearing between W. ½ S. and N.E. ¼ N. through North, and *bright* between N.E. ¼ N. and S.S.E. Between S.S.E. and W. ½ S. the light is obscured. It is elevated 27 ft. above the level of high water, and in clear weather the bright light should be seen from a distance of 10 miles. In line with Eastern Light it leads through South Channel, as hereafter explained.

Tidal Signals are shown from the Pile lighthouse, giving the depth in the deepest part of the passage near the lighthouse:—A blue flag, 25 ft.; ball, 25½ ft.; ball under blue flag, 26 ft., over flag, 26½ ft.; two balls, 27 ft.; two balls over red flag, 27½ ft., under flag, 28 ft.; red flag between two balls, 28½ ft.; red flag, 29 ft. By night a *green light* represents the blue flag, a *bright light* the ball, and a *red light* the red flag.

Arthur's Seat, E. by S. nearly 14 miles from Shortland Bluff, and in lat. 38° 21′ 20″ S., long. 144° 57′ 10″ E., is so named from its supposed resemblance to the hill of that name near Edinburgh; it is a conspicuous bluff 975 feet high, sloping down to the S.E., and is visible nearly 40 miles at sea. From the southward its N.W. extreme appears precipitous, and being the highest land on the coast, is a remarkable object by which to distinguish the entrance to Port Phillip.

Eastern Light, immediately under Arthur's Seat, is a *fixed* light, showing *red* when bearing between S. by W. ½ W. and S.E. ¼ E., and *bright* between S.E. ¼ E. and E. by N. ½ N., elevated 80 ft. above the level of high water, and in clear weather the bright light should be seen from a distance of 14 miles. At 40 ft. below this light, and in the same tower, is a *fixed bright* light, visible when bearing been S. by W. ½ W. and S.E. ¼ E.

Dromana Bay.—From the foot of Arthur's Seat the shore curves N.E., North, and N.W. 4 miles to Martha Point; the N.E. part of this bight forms Dromana Bay. A *green* light is shown on the jetty.

Balcolms Bay extends from Martha Cliff N. by E. ¼ E. nearly 3 miles to Fisherman Point, but is barely two-thirds of a mile deep. *Fisherman Bay*, which is the water frontage of *Mornington*, is merely a slight indentation of the coast, extending from Fisherman Point N. by E. nearly 1 mile to Schnapper Point.

Schnapper Point and Lights.—The point projects a quarter of a mile from the line of coast, and has a small jetty for the convenience of the coasting trade. A *fixed bright* light is shown at an elevation of 50 ft., on the point, visible 10 miles. At the end of the jetty is a mast with a lamp 30 ft. high, showing a *fixed red* light, visible 3 miles.

From Schnapper Point the coast trends N.E. by N. 4 miles to Davy Point. It is slightly embayed; and from Davy Point, after receding nearly half a mile to the eastward, extends N.E. ½ N., 1½ mile to the village of *Frankston*. The S.E. shore of Port Phillip, which is mostly wooded, has several townships, and numerous houses and other buildings are scattered along it.

From *Ricket Point*, 11 miles from Frankston, a mostly rocky coast extends N.W. ¾ N. 3¼ miles to *Picnic Point*. The coast between Ricket and Picnic Points is bordered by foul ground and sunken patches, some with only 4 and 5 feet water on them, extending nearly half a mile from the shore. A spit projects S.W. from Picnic Point to 3 fathoms at half a mile off.

Anonyma Shoal is a rocky patch one-third of a mile long, N.W. and S.E., and 1½ cable broad, with 1 foot water on its shoalest part; there is 4 fathoms at a cable's length from its outer edge, and 3½ fathoms between it and a quarter of a mile off the beach. There is a *chequered* beacon on this shoal bearing S. by W., distant three-quarters of a mile from Picnic Point, and two-thirds of a mile from the shore.

From Picnic Point to Green Point, N.W. by N. ¼ N. 1⅓ mile from it, the coast forms a slight indentation, bordered by a shoal.

Green Point appears to be most worthy of notice from its being at present the southern terminus of the Brighton Railway. The *Brighton Railway* runs from Green Point about 4½ miles to the northward, passing behind Brighton and St. Kilda, when, after a westerly curve of 1¼ mile round the North end of the latter town, it turns north-westward 3 miles to Melbourne.

HOBSON BAY, the port of Melbourne, extends from Point Ormond West 3½ miles to Point Gellibrand, and is 2 miles deep; but the western portion only is available for shipping, nearly all the eastern half of the bay being occupied by a shallow bank. It has good anchorage in 3 to 5 fathoms, over stiff mud and clay.*

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* Notice was given in January, 1884, that a space southward of Williamstown breakwater pier is appropriated as a *Torpedo Ground*, comprised between lines drawn from Gellibrand lightvessel to the outer extremity of the breakwater pier, and to the old lighthouse. Vessels must not anchor in this vicinity.

From Point Ormond the low eastern shore of Hobson Bay trends N. by W. ½ W. a little more than a mile to a jetty at the West point of the town of *St. Kilda;* the jetty projects from the shore 160 yards into 6 ft. water, and a *green light* is shown on its extremity. The 6-ft. edge of the shoal which borders the shore extends from a little more than a cable's length off Point Ormond to about 30 yards within the outer end of the jetty. For about one-third of a mile northward from Point Ormond there are numerous rocks scattered over the shoal.

The N.E. shore of Hobson Bay, from about a quarter of a mile northward of the jetty of St. Kilda, extends in a straight line N.W. by W. ¾ W. 2 miles to Sandridge Pier. There is 9 ft. water within a cable's length of the shore from the jetty to the pier.

Sandridge Pier projects from the main street of Sandridge, nearly S.W. by S. 530 yards, into 19 ft. water. At the outer end of the pier is a *fixed red light*, visible 2 miles. Four *red* buoys are moored in line along the S.E. side, and three on the N.W. side of the pier, from which the former are distant about 100 yards, and the latter 70 yards.

Railway Pier.—At 3 cables W. by N. ½ N. from Sandridge Pier the Melbourne and Hobson Bay Railway Pier extends from the shore S. by W. ½ W. 730 yards, into 20 ft. water. At the outer extremity of the pier is a *fixed green* light, visible 2 miles. There is a *black* buoy on either side of the pier, at about midway between its extremity and the shore; that on the S.E. side, in 19 ft. water, being 70 yards, and the other, on a 16-ft. spit projecting from the shore, being 170 yards from the pier.

Point Gellibrand.—From the southern extreme of Point Gellibrand a low rocky shore trends N.E. nearly two-thirds of a mile to the East extreme of the point, the site of the old lighthouse, and is bordered by ledges of rocks, with spits of foul ground, which, midway, extend a quarter of a mile from the shore towards the lightvessel.

Point Gellibrand Lightvessel is moored in 5 fathoms, at 1 cable S.S.E. from the S.E. elbow of the bank which projects from Point Gellibrand, with the South extreme of the point bearing W. by N. ¼ N., and the old lighthouse on the East extreme of the point, bearing N. by W. ½ W. The vessel is painted *red*, has one mast and ball, and exhibits a *bright* light, 40 ft. high, which *flashes* every half minute, and is visible 10 miles. A *horn* is sounded alternately with a *gong* every 10 minutes in foggy weather.

From near the site of the old lighthouse two railway piers, in connection with the Melbourne and Williamstown Railway, extend in a N.E. and N.N.E. direction, with 20 to 22 ft. at low water at their extremities. At the head of the easternmost a *red light* is shown. Westward of the railway piers is a graving dock, with 24½ ft. at its entrance at low water, also patent slips, wharves, &c.

Time Signals.—On the old lighthouse on Gellibrand Point, at 72 ft. above high water, a ball is hoisted halfway up a staff at $12^h\ 55^m$ p.m., and at $1^h\ 0^m$ p.m., Melbourne mean time, it is dropped. Another ball is dropped at the same time at the Telegraph Office, Geelong, and at Queenscliff Signal Station a flag is dipped. Melbourne Observatory is in lat. 37° 49′ 53·4″ S., long. 144° 58′ 42″ E., but a later determination by telegraph places it in 144° 58′ 21″ E., or $9^h\ 39^m\ 53{\cdot}41^s$ in time.

The entrance of the *Yarra* or *Jarra River*, in the N.W. corner of Hobson Bay, is marked off its entrance by a black mast buoy, and the channel within for a distance of a mile is marked by beacons on the stone embankments constructed on either side of the channel. A *red light* is shown on the head of the western breakwater, and a *green light*, 2½ cables north-westward of it, on the same breakwater. These lights in line lead up to the entrance, and the green light in line with a red light S.S.E., 3 cables from it, leads up between the embankments. At present vessels drawing 16 ft., at high tides, can reach Melbourne, which is situated 8 miles above the mouth of the river; the river is being deepened. A least depth of 11 ft. is found in the channel at low water. A large stone wharf has lately been completed at Melbourne, alongside which large vessels can be accommodated; there is a crane here capable of lifting 50 tons.

MELBOURNE, the capital of the colony of Victoria, was first founded in 1835, and has rapidly risen to its present importance; in 1881 its population amounted to 65,790. There is a dry dock here which will admit a vessel of 1,100 tons, and a wet dock of large area is proposed. Railways extend in all directions to various parts of the colony; in 1883 there were 1,355 miles open.

Western Arm of Port Phillip forms the approach to Geelong, commencing with the southern shore at Point George.

The southern shore of the Western Arm of Port Phillip, after a slight curve for a little more than three-quarters of a mile in a N.W. by W. direction from Point George, extends W. by N. 1½ mile, and from thence nearly West 1⅔ mile to *Point Richards*. From Point Richards the shoal projects N.W. by N. half a mile to a spit with 10 ft. water on it, at a quarter of a mile to the northward of which is a *red* buoy, moored in 4½ fathoms, with Point Richards, bearing S.S.E., distant three-quarters of a mile.

At Portarlington a *fixed green light* is shown at the jetty head, visible 5 miles off. A *red light* is also visible between the bearings W.S.W. and S.E. by E. It should be visible 7 miles off, and kept in sight clears the Prince George Bank, and also the shoal water off Point Richards.

From Point Richards the shore trends S.W. 4¾ miles to *Bellarine Jetty*, which projects about 100 yards from the land, and from thence the shore trends W. by S. ½ S. 2½ miles to a slight projection of the land forming the South point of the S.E. entrance of the Ship Channel, through the Outer Har-

bour of Geelong; some rocks lie close to the shore on either side of the jetty, and between one and two-thirds of a mile to the westward of it.

The S.E. entrance of the Ship Channel into, and through the Outer Harbour of Geelong, lies between the slight projection of the land on the South side, and *Wilson Spit*, the extremity of a bank extending from the North shore to 18 ft. water, at $1\frac{1}{3}$ mile from the South shore. A *white* perch buoy is moored in 5 fathoms at a quarter of a mile South from the spit, and N. by W. a little more than 1 mile from the South entrance point. Two *black* buoys are moored on the southern side of the entrance, one in 4 fathoms, bearing S.E., distant half a mile, and the other in $3\frac{1}{2}$ fathoms, bearing S.W., distant nearly 1 mile from the *white* perch buoy.

The channel through this entrance is upwards of three-quarters of a mile wide, with $3\frac{1}{2}$ to 5 fathoms, the deepest water being between the *white* perch buoy and the *black* buoy to the south-eastward of it; but a bank with 19 to 23 ft. water over it, lies between a quarter of a mile and two-thirds of a mile to the south-westward of the *white* perch buoy.

The shore from the South entrance point of the Ship Channel forms a bay extending N.W. by W. $\frac{3}{4}$ W. 4 miles to *Point Henry*. It is barely 1 mile deep, and is mostly occupied by a bank, the 3-fathoms edge of which projects from 4 cables off the South entrance point to three-quarters of a mile eastward of Point Henry, where a spit, with 16 ft. water on it, extends a quarter of a mile northward from the edge of the bank.

The land between Points Richards and Henry is mostly low, the hills scattered over it rarely exceeding 120 ft. in height, except the summit of Bellarine, S. by W. $2\frac{3}{4}$ miles from Point Richards, which attains an elevation of 447 feet.

Point Henry is low, the Bluff, which is its most elevated part, being only 25 ft. above the mean level of low water springs. A jetty projects about 150 yards from the East side of the point into 3 ft. water.

The Northern Shore.—Beacon Point is opposite Point Richards. From it a shoal spit projects two-thirds of a mile towards a *beacon* bearing S.E. by E. $\frac{1}{2}$ E., distant 1 mile from the point. From Beacon Point the shore extends S.W. by S. $\frac{1}{4}$ S. $1\frac{1}{3}$ mile to *Kirk Point*, and is also fronted by a bank.

From Kirk Point the low shore trends W.S.W. 2 miles, and from thence South $2\frac{3}{4}$ miles to *Point Wilson*, forming a bay, of which the bight for a distance of $1\frac{1}{2}$ mile is filled by a mud-flat.

From half a mile off Kirk Point the 3-fathoms edge of an extensive bank, with some shallow patches on it, curves in a S.S.W. and S.S.E. direction to a spit with 9 ft. water on it, marked by a *black* and *red* buoy, moored in 3 or 4 fathoms, from which Point Wilson bears S.W. by W. $\frac{1}{2}$ W., distant $2\frac{1}{4}$ miles. From the extremity of this spit, the 3-fathoms edge of the bank, after turning two-thirds of a mile to the north-westward, extends S.S.W. $2\frac{3}{4}$ miles to another spit, having 15 ft. water on it, and marked by a *red* perch buoy, moored on

the bank in 14 ft. water, at S.S.E. 1 mile from Point Wilson; some small detached banks with 15 to 17 ft. water on them lie within half a mile eastward and southward of the buoy.

From between one-third and two-thirds of a mile westward of the *red* perch buoy, a continuation of the bank which extends from Point Wilson, trends S.S.E. and S. by W. ½ W. 2 miles to Wilson Spit, which forms the North side of the S.E. entrance of the Ship Channel into, and through the Outer Harbour of Geelong. This projecting bank, which has 13 to 17 ft. water on it, is only 1 to 3 cables broad, the narrowest part being midway between the *red* perch buoy and the spit.

Point Wilson is low, with a small islet close off it, and numerous rocks extending about a cable to the southward. Two detached patches, having 5 and 6 ft. water on them, lie respectively E.S.E. one-third of a mile, and S.E. ½ S. half a mile from Point Wilson.

GEELONG OUTER HARBOUR extends North and South 3½ miles between the 3-fathoms edges of the banks fronting the North and South shores, and is bounded to the eastward by the bank which projects from Point Wilson to Wilson Spit. On the West side it is separated from the Inner Harbour by the bank and narrow ridge extending from Point Lillias and a collection of other banks, forming together a bar, which stretches across from Point Henry to Point Lillias and the shore to the westward of it.

The soundings over the Outer Harbour are remarkably even, rarely varying from 4 to 4¾ fathoms, except on the western side, where there is 5 to 5½ fathoms.

The Ship Channel, from its S.E. entrance, between the *white* and *black* buoys off Wilson Spit, crosses the southern part of the Outer Harbour in a N.W. by W. direction to the *Outer Artificial Cut* through the bank extending from Point Lillias. This passage, which bears N.E. by N. from the bluff on Point Henry, and S.E. by S. ¼ S. from Bird Rock, has been dredged through the bank 1 cable's length in a S.E. and N.W. direction, and is half a cable wide, with 19 ft. water.

This channel is marked by two *black* buoys on the S.W., and two *white* ones on the N.E. side; the eastern buoy, which is cone-shaped, as a distinguishing mark, is moored broad end down; it swims nearly upright, and is surmounted by a staff and ball; the other three are cask buoys. There is also a *white* buoy on the edge of the bank at a quarter of a mile north-eastward of the *white* cone buoy.

At half a mile N.W. from the Outer Artificial Cut, is the eastern entrance of the *South Channel*, cut through the bank which extends from Point Henry to the North shore; this is the deepest entrance to Geelong Inner Harbour. It is 1¼ mile long, E. ½ N. and W. ½ S., and 132 ft. wide at the bottom, sloping to 165 ft. at the surface, at its narrowest part. This channel, which has been dredged to the depth of 18 ft., has a *black* buoy on each side of its

eastern entrance, that on the South side being surmounted by a staff and ball. Within the entrance the channel is marked on the South side by *black*, and on the North side by *white* beacons.

The eastern entrance of the *North Channel* lies between a quarter of a mile and 4 cables westward of Bird Rock beacon, and has a lightvessel nearly in mid-channel, moored in 12 ft. water, at 3½ cables from the beacon. From the *white* perch buoy south-westward of Bird Rock, the 12-ft. edge of the bank which forms the eastern and northern limits of the channel turns northward, and then curves westward to a projection of the bank, close to the westward of which is a *red* buoy, W. by N. ½ N. a quarter of a mile from the lightvessel.

The Bar.—From the *red* buoy, the northern side of the North Channel, after trending W.N.W. one-third of a mile, curves round 1½ cable to the bar, which is 1 cable broad, with 9 to 11 ft. water on it.

The channel is bounded to the southward by the 12-ft. edge of the bank, which, from the middle of the North side of the South Channel, trends N. by E. ½ E. to a spit within 100 yards of the lightvessel and 150 yards of the North side of the channel. Between this and another projection of the bank, on which is a *black* buoy, bearing West, distant half a mile from the lightvessel, is a bight in the bank, with 12 to 14 ft. water, trending 3 cables to the south-westward.

From the western side of the bar the North Channel trends S.W. ½ W. one-third of a mile to its western entrance, with a width of 150 to 200 yards between the 12-ft. edges of the bank, and is marked by *black* buoys or beacons on the southern, and *red* on the northern side.

Geelong Lightvessel, which lies nearly in mid-channel, in the eastern entrance of the North Channel, is painted *red*, and shows a single *fixed bright* light, 27 ft. high, visible 7 miles; and two *red* lights, should she break adrift. A *gong* is sounded every 10 minutes in foggy weather, and signals are made on board to show the depth on the bar.

A blue flag, 10 ft.; a ball, 10½ ft.; a ball under a blue flag, 11 ft.; a ball over a blue flag, 11½ ft.; two balls, 12 ft.; two balls over a blue flag, 12½ ft.; two balls under a blue flag, 13 ft.; two balls over a red flag, 13½ ft.; two balls under a red flag, 14 ft.; a red ball between two balls, 14½ ft.; a red flag, 15 feet. The tide rises 3½ ft. at springs, and 2½ ft. at neaps.

GEELONG INNER HARBOUR, the most spacious and secure anchorage in Port Phillip, extends from Limeburners Point North nearly 4¼ miles to the entrance of Limeburners Creek, and is 2½ miles wide, between the western shore and the 6-ft. edge of the bank which extends from Point Henry to the North shore. The soundings are remarkably regular, over mud, the depth gradually increasing from the 3-fathoms edge of the bank on the eastern side, to 5 and 5½ fathoms within a quarter of a mile of the western shore, and to 4 fathoms at 2 cables off the town of Geelong, in the S.W. bight of the harbour.

GEELONG.—From Limeburners Point the water frontage of the town of Geelong forms a bay two-thirds of a mile deep, extending from the point N.W. by W. $\frac{1}{4}$ W. $1\frac{2}{3}$ mile to Hutton Wharf. There is generally 6 ft. water within 150 yards, and 22 to 24 ft. water within $1\frac{1}{2}$ cable of the shore. Wool is shipped from here, and it is in communication with Melbourne by railway. There are three jetties, where large vessels can load and discharge. A *red light* is shown on the railway pier, and *bright* lights on the steam-boat jetty and pier-head.

DIRECTIONS—For Port Phillip from the Westward.—Vessels from the westward bound to Port Phillip usually make the land about the high bold promontory of Cape Otway, which is easily distinguished by the *white* circular lighthouse on it, with the revolving light, and the telegraph station, to which passing vessels, whether bound to Port Phillip or not, are recommended to communicate their numbers, and what intelligence they may have.

It is desirable to round Cape Otway at a distance of not less than 3 or 4 miles, and when the lighthouse bears W. by N. $\frac{1}{2}$ N., distant 6 miles, the course and distance to Port Phillip Heads will be N.E. 56 miles, passing $3\frac{1}{2}$ miles outside Henty Reef, to avoid which, see p. 1056. As no other dangers project beyond a mile from the shore, they will be cleared by giving the coast a berth of not less than 2 miles. Should the cape be rounded early in the evening, with a fresh southerly breeze, beware of overrunning the distance, as a strong current, after a prevalence of southerly gales, often sets along the land to the N.E.; and when abreast of Split Point, if a stranger finds there will not be sufficient daylight to get into pilot waters, he should stand off and on under easy sail till daylight, not shoaling to less than 20 fathoms.

After passing Split Point, 36 miles to the north-eastward of Cape Otway, if the weather be at all clear, Arthur's Seat will be seen rising inland over the waters of Port Phillip before the lower and nearer land in that direction becomes visible. Proceeding onward, the land about Cape Schanck will be seen to the eastward, appearing at first like a long, low island trending to the S.E. On nearing the entrance, Barwon Head will be open on the port bow. This headland, formerly known as Flinders Point, is a good mark for making the port; but in thick hazy weather care must be taken not to mistake this for Port Phillip Heads, which in several instances has led to vessels going ashore. A signal buoy is now moored off it.

Vessels from the southward and westward sighting Shortland Bluff high light to the eastward of N.E. by E., should, to avoid Barwon Bight, haul out eastward, to open Shortland Bluff low light, which will be first seen on a N.E. by E. bearing; and in proceeding to bring the two lights in line, the low light will change from *bright* to *red*, on a N.E. bearing.

From the Eastward.—Vessels steering for Port Phillip from the southward and eastward usually make the land about Cape Schanck, 17 miles to the south-eastward of the entrance, with a lighthouse on its highest part, exhibit-

ing a fixed and flashing light. Vessels having passed Cape Schanck should keep a good offing, in proceeding towards the heads, until they open out Shortland Bluff lighthouses, which the intervening land of Nepean Point prevents being seen before the high fixed light bears N. ¼ W., and the low light N. ½ E.; and in proceeding to bring the two lights in line, the low light will change its colour from *bright* to *red* on a N.N.E. bearing.

To ensure passing outside Lightning Rock, the lighthouse on Point Lonsdale should not be brought to the westward of N.W. until the two lighthouses on Shortland Bluff are in line. And a stranger making the entrance at night, within the range of the *green* light of Point Lonsdale, must bear in mind that the line of its outer limit passes within three-quarters of a mile of Lightning Rock, and the blending of the *green* with the *red* light is in a direct line over the rock.

Caution not to Heave-to.—At night a vessel should keep a good offing, and on no account be hove-to when waiting for daylight near Port Phillip Heads. Several vessels that have done so have drifted into danger; two, the *Sacramento* and the *Earl of Charlemont*, were lost, one on Point Lonsdale, and the other on Charlemont Reef, from this cause, combined with inattention to the lead and the state of the tide.

Causes of Wreck at the Heads.—A careful inquiry into the casualties which have occurred at the entrance of Port Phillip has shown that in nearly every case they have taken place in consequence of the vessel either attempting to enter the heads at night without a pilot, or against a strong ebb stream; which it must be remembered, runs partly athwart the entrance with great force, frequently at the rate of 7 knots, causing a high confused tumbling sea, which, in southerly or westerly gales, often breaks from point to point. The mariner must not suppose that because he has a fine fair wind outside the heads he can always force his vessel against the ebb. To this error is attributable the loss of several vessels. The wind, although fresh outside, frequently falls light just as the vessel gets into the tide ripple between the heads, when she becomes unmanageable; and even with a strong breeze, vessels often shear athwart the tide, which hereabouts forms a series of strong irregular eddies.

To enter the Heads with the Flood.—Should a pilot not have been taken on board outside the heads, and the last quarter ebb signal be up, or the flood stream be made, steer, when within 8 or 10 miles of the entrance, to bring the high lighthouse on Shortland Bluff to bear N.E. by N., which will be in line with the low lighthouse; and with a fresh fair wind and flood stream, steer so as to keep the two lighthouses in line, until the *red* beacon on the rocky islet off Point Nepean is open to the southward of that point.

Lonsdale Rock is cleared on the East side by keeping Swan Island beacon open of Shortland Bluff, until Point Lonsdale telegraph house, *white* with a slate roof, opens well to the northward of the tidal flagstaff. Vessels drawing

less than 14 ft. may, in the daytime, pass between Lonsdale Rock and Reef by keeping Swan Point a little open of Shortland Bluff.

Lightning Rocks are cleared on the West side by keeping the *red* obelisk on Shortland Bluff touching the East side of the high lighthouse, N.E. by N. $\frac{1}{4}$ N., until Point Lonsdale telegraph house opens well out to the northward of the tidal flagstaff.

A vessel entering between the Lightning and Corsair Rocks will clear the West side of Corsair Rock by keeping the two beacons in Lonsdale bight in line N.W. by N. $\frac{3}{4}$ N., or by keeping the low lighthouse on Shortland Bluff in line with the East end of the light-keeper's house near the high lighthouse, N.E. by N. $\frac{3}{4}$ N., until the *white* beacon on Point Nepean is well open northward of the *red* beacon on the rocky islet off that point.

With a scant or light easterly wind and flood stream, Swan Island beacon must be kept open of Shortland Bluff, so as to avoid Lonsdale Rock.

To enter the Heads against the Ebb steer, when within 2 miles of the heads, to get the low lighthouse open to the East of the high one, until the vessel draws near Point Lonsdale, when haul as close round Lonsdale Reef as practicable; taking care, however, if her draught be more than 14 ft., to avoid Lonsdale Rock by not shutting Swan Island beacon in with Shortland Bluff, and on no account to shut in Swan Point with Shortland Bluff until clear of Lonsdale Reef, and the *red* beacon on the rocky islet off Point Nepean is open to the southward of that point, when the rocks and reefs in the entrance will be clear.

To work in between the Heads.—This is best done near the time of slack water, when the race will be nearly quiet, and the vessel will be much more under command. In standing to the westward, Swan Island beacon must be kept open of Shortland Bluff until Point Lonsdale telegraph house opens well to the northward of the tidal flagstaff. Vessels of light draught may stand more in-shore, keeping Swan Point a little open of Shortland Bluff, making due allowance for the set of the flood stream. After clearing Lonsdale Rock and Reef, keep Swan Spit lighthouse open of Shortland Bluff, in order to avoid Victory Shoal and the foul ground between Point Lonsdale and Shortland Bluff.

In standing to the eastward, a vessel should not proceed farther than when the obelisk on Shortland Bluff touches the East side of the high lighthouse, bearing N.E. by N. $\frac{1}{4}$ N., to avoid Lightning Rock and the tide ripples near Point Nepean.

At Night.—The passage through the heads should not be attempted at night, except with steam or a commanding fair wind; but to enter under either of these favourable circumstances, when the high and low lights on Shortland Bluff are clearly distinguished, the low light showing *red*, they must be brought in line, bearing N.E. by N., which will lead through the fairway, nearly midway between the Lonsdale and Lightning Rocks.

Should the wind become scant, and a vessel be compelled to tack when near Lonsdale Reef or Corsair Rock, these dangers will be avoided by vessels of light draught, so long as Shortland Bluff low *red* light is kept in sight; but they must be careful to go about or haul towards mid-channel before the low light changes from *red* to *bright*.

In entering, Point Lonsdale light will first appear *green*, bearing N. by W., and so long as this colour is in full view the vessel will be to seaward of the Lonsdale and Lightning Rocks; when the *green* begins to blend with *red*, bearing N.W. ½ W., she will be in the fairway, in line between the two rocks; when the *red* light opens into full view she will be past these dangers; and when the *red* light is seen, on a W. by N. bearing, the vessel will be inside Corsair Rock.

Anchorage.—Having entered and cleared the dangers which lie between the heads, a vessel may proceed north-eastward for the anchorage off Shortland Bluff, towards the West Channel; or a vessel of great draught, eastward, for the anchorage off the Sanitary Station, in the entrance of the South Channel. Strangers entering the port from stress of weather should not attempt to proceed above these anchorages without a pilot.

In the following directions for West Channel, we have retained the directions in use previous to the destruction of Swan Spit lighthouse in 1881, *as mentioned on p.* 1041. *A lightvessel is temporarily moored* 1 *cable E.N.E. of its site.*

Off Shortland Bluff.—If necessary to anchor off Shortland Bluff before going through the West Channel, steer north-eastward from the entrance, keeping Swan Spit lighthouse open of Shortland Bluff, to avoid Victory Shoal; and if of heavy draught, she should anchor on the S.E. side of the fairway, which is shown in the daytime by Swan Spit lighthouse being just open West of No. 2 *white* perch buoy; at night by Swan Spit light changing from *red* to *bright*, N.E. ¾ N.

With the view of keeping the fairway to the West Channel clear, vessels of light draught, when anchoring off Shortland Bluff, should bring up as close towards the shore as possible on the N.W. side of the fairway, with Swan Spit lighthouse just open East of No. 1 *black buoy;* and at night, with Swan Spit light changing from *red* to *bright*, on a N.E. ½ E. bearing.

When about to anchor off Shortland Bluff at night, it must be remembered that the low light shuts in on a W. by N. bearing.

West Channel.—If bound directly through the West Channel, after entering the heads and clearing the dangers in the entrance, steer N.E. from the fairway between Points Lonsdale and Nepean, to pass on the West side of No. 2 *white* perch buoy, keeping Swan Point well open of Shortland Bluff, to avoid Victory Shoal, and giving the bluff a berth of at least 2 cables' lengths, to avoid the reef which projects from it. Having passed Shortland Bluff, keep Point Lonsdale lighthouse open of it, S.W. by W. ¼ W., which will clear the bank between Shortland Bluff and Swan Spit.

When abreast of No. 2 *white* perch buoy bearing S.E. by E., a cable distant, steer N.E. by E. until Swan Spit lighthouse bears West; then steer N ¼ E., passing 1½ cable eastward of the *chequered* buoy on the 13-ft. shoal, and 1 cable westward of No. 6 *white* buoy. When Swan Spit lighthouse bears S.W. by S. bring it astern and steer N.E. by N. (passing three-quarters of a cable westward of No. 8 *white* buoy) until No. 3 *black* buoy bears W. by S. ½ S. distant 3½ cables; then steer N. ¾ E. passing 1 cable westward of No. 10 *white* buoy, until West Channel pile lighthouse bears about North, when steer to pass not less than half a cable eastward of it. Vessels with a scant wind, proceeding up against the ebb stream, must not stand too near the eastern bank, as they are liable to be set upon it, especially at the northern end of the channel.

Vessels of less than 15 ft. draught may enter the West Channel between the Pope's Eye and the Royal George Sands by passing 2 cables westward of the Pope's Eye *red* buoy, and then steering N.N.E. until the two *white* buoys on Royal George Sand come in line; when, after leaving the eastern *white* buoy about a cable to the westward, steer so as to pass to the eastward of the shoals off Swan Spit lighthouse.

At Night.—Vessels steering for the West Channel will avoid the reef which projects from Shortland Bluff and the bank between it and Swan Spit, and will clear the western end of Royal George Shoal, by keeping the Swan Spit *red* light in view until Queenscliff jetty *green* light bears W. by S., when they will be above No. 2 *white* perch buoy, and should haul to the eastward, and open Swan Spit *bright* light, N.E. ¾ N., giving the lighthouse a berth of 3½ cables in passing eastward of it.

In leaving by this channel the red sector from Shortland Bluff low lighthouse will lead from Swan Spit to between buoys Nos. 1 and 2. Vessels should haul to the eastward when Queenscliff jetty light bears about W. by N., sufficiently to clear the reef off Shortland Bluff.

West Channel to Hobson Bay.—From West Channel pile lighthouse the course is nearly N. by E. ¼ E., and the distance 20½ miles to Point Gellibrand lightvessel. There are no dangers in the way, and the soundings are regular, gradually increasing from 9 fathoms at a mile north-eastward of West Channel lighthouse to 12 fathoms midway, and from thence decreasing to 6 fathoms at 1 mile to the southward of Point Gellibrand lightvessel; the bottom being soft mud and shells, a vessel may anchor anywhere along this route.

Working Up.—Vessels working up from the West Channel pile lighthouse to Hobson Bay must not stand into less than 5 fathoms on either side, nor approach the western shore nearer than 3 miles, until Station Peak comes on with Point Cook, W. by S. ¼ S.; when, in standing to the westward, Point Gellibrand lightvessel must not be brought to the eastward of E.N.E., nor must Point Gellibrand be approached within half a mile, until to the northward of it. And it should be remembered that the bottom, at the distance of

a mile off shore, from Point Gellibrand to Point Wilson, is rocky with shoal patches.

South Channel.—If bound through the South Channel, after having entered and cleared the dangers between the Heads, steer along the North side of the land of Point Nepean, in 8 or 9 fathoms, with Barwon Head just open of Point Lonsdale, nearly W. ½ S., passing half a mile to the southward of Pope's Eye *red* buoy, and midway between the North *chequered* buoy on Nicholson Knoll, and No. 1 *black* perch buoy, at about half a mile from either. Between *black* buoys Nos. 1 and 3 is a bank of 3½ fathoms, its shoalest part being 1½ cable South of the line joining these buoys, and 2¼ cables northward of the fairway. From thence steer nearly midway between the *white* buoys, which mark the South side, and the *black* buoys, which mark the North side of the channel, bringing the South Channel pile lighthouse in line with Arthur's Seat lighthouse, bearing E. ¾ S., as soon as possible, when steer for it. If in a vessel of heavy draught, when at a quarter of a mile from the lighthouse haul to the northward, to avoid the 20-ft. patches to the westward of the lighthouse on the line of the leading mark.

Having passed out of the South Channel between the pile lighthouse and No. 11 *black* buoy at 3½ cables to the north-eastward of it, continue East or E. ½ S., according to circumstances, so as to pass about 1 cable southward of No. 13 *black* buoy, then steer E. by N. and round, on the S.E. side, No. 15 *black* perch buoy, which marks the eastern spit of the Middle Ground. The banks on either side are steep-to, with the flood setting strongly over the southern banks.

Working through.—Vessels working through the South Channel must be guided by the lead, not standing into less than 4 fathoms on either side, nor within the line of buoys; bearing in mind the tide streams which set over the banks. After passing the pile lighthouse there is plenty of room between the Middle Ground and the shore, which is approachable within three-quarters of a mile, in 5 fathoms. When clear of the Middle Ground, and to the northward of Martha Point, a vessel may stand westward until Point George comes on with Station Peak, bearing nearly N.W. by W. ½ W.

At Night.—If bound through the South Channel at night, after getting well inside the heads, steer eastward, taking care to keep close to the southward of the W. by S. limit of Point Lonsdale *red* light, to clear the shoals which border the northern shore of Point Nepean; the least depth of water being 16 ft., on the small patch which bears S. ¼ E. from Shortland Bluff high lighthouse.

Entering the South Channel, steer in with the South Channel lights (see pp. 1042-3) in line, showing *bright*, bearing E. ¾ S.; but vessels of large draught should, on approaching within a quarter of a mile of the Pile lighthouse, open the Eastern light well to the northward of the Pile light, in order to avoid the 20-ft. patches. After passing the Pile lighthouse, steer about

East and into the red colour of the Pile light before reaching No. 13 buoy. Do not obscure the Pile light till the Eastern light shows red, with the lower light *bright*, the vessel will then be clear of the East end of the Middle Ground, and may steer for Melbourne or Geelong.

Vessels leaving for sea by the South Channel, having made the Eastern light, *red*, and the lower *bright* light, should steer for them until the Pile light is seen, red, bearing W. ½ S., when a course may be shaped for the latter so as to pass on the North side, and when passed, the leading lights in one, with the course W. ¾ N., will lead through the channel.

When to the northward, and in the vicinity, of the Middle Ground and Great Sand, sailing vessels working down will know they are standing into danger, when either the South Channel Pile light or the high Eastern light shows bright. They will also know their proximity to the eastern shore when the Eastern light ceases to be visible.

Vessels may find safe anchorage in Capel Sound with the Pile light showing red.

Tides.—It is high water at Queenscliff, on full and change, at $10^h\ 50^m$, springs rise 3ft. 1 in., neaps 2 ft.; at Hobson Bay, at $2^h\ 30^m$, springs rise 2 ft. 8 in., neaps 2 ft. 2 in., at Geelong Harbour, at $2^h\ 30^m$.

The COAST of VICTORIA, to the westward of the entrance of Port Phillip, trends about S.W. ¼ W. from Point Lonsdale for 69 miles to Cape Otway. The only noticeable point in the interval is the *Henty Reef*, a dangerous rock of 18 ft. water, at 9¾ miles N.E. ¾ E. from Cape Otway lighthouse. Its position is marked by two pairs of pillar beacons on the adjacent shore; it lies on the intersection of these beacons brought in line.

CAPE OTWAY, the northern point of the western entrance of Bass Strait, is a bluff cliffy projection, 250 ft. high. A rocky ledge, with 10 ft. water on its shoalest part, lies S.S.E. three-quarters of a mile from the cape; and a very heavy ripple extends nearly 2 miles from the shore, with the lighthouse bearing N. by E. to N.N.W. This ripple had, until sounded by the surveying officers, been looked upon as a dangerous reef, and is still thought to be so, a vessel having had a boat washed away when passing near it.

Light.—A white circular lighthouse, 62 ft. high, stands on the S.W. extreme of Cape Otway, in lat. 38° 51′ 45″ S., long. 143° 31′ 10″ E. It exhibits a *revolving bright* light, once in every minute, elevated 300 ft., and visible 24 miles.

At 48 ft. below the revolving light a *red danger* light is shown, screened so as to be obscured from seaward until 4 miles distant on a N. by W. bearing, and will be visible to a vessel proceeding on a W. by S. or E. by N. course, until out of sight at 8 miles distant. When seen a vessel should alter course to

run this light out of sight, to avoid the dangers off the cape. Great caution is necessary in foggy weather.

On Cape Otway there are also a *telegraph station* and flagstaff; the former is in hourly communication with the capitals of Victoria, South Australia, and Tasmania.

LADY BAY is an indentation of the mainland, at 54 miles W.N.W. of Cape Otway, extending from its rocky western point E. by N., $1\frac{3}{4}$ mile to Hopkins River, from which Hopkins Reef projects one-third of a mile to the southward, and is awash at high water.

WARRNAMBOOL HARBOUR, on the western side of Lady Bay, is formed by several outlying islands and rocks, nearly connected with each other, which extend from Point Pickering in a S.E. and E.S.E. direction. The largest of these is named Middle Island. Between Middle Island and Point Pickering is Merri Island, and outside to the eastward is Breakwater Rock, 18 ft. above high water, and encircled by sandstone ledges.

Merri Island, lying half a cable S.S.E. from Point Pickering, to which it is all but attached by half-tide rocks, is 47 ft. high, and very small.

Middle Island, the central and largest of the three islets which form Warrnambool Harbour, is 250 yards long N.W. and S.E. It lies S.E. of Merri Island, to which it is almost joined by rocks of various heights. From Middle Island, in a southerly direction, for a distance of a cable, extend several half-tide rocks, and at a further distance of 4 cables in a S.S.E. direction is a dangerous rocky patch of 17 ft.

Lights.—Leading lights are exhibited for entering the harbour. The upper, *fixed bright*, is shown from a tower erected on the site of the upper obelisk, elevated 109 ft. above the sea, and visible 14 miles off when bearing from East, round by North, to N.W. The lower, *fixed red*, is elevated 87 ft., shown from the top of the lower obelisk, 140 yards distant, and visible 5 miles when bearing between N. $\frac{1}{8}$ E. and across the 5-fathoms bank to N.W. The two lights in line North lead through between the 5-fathoms bank and the foul ground to the north-westward.

Breakwater Rock, a small islet 18 ft. high, lies a cable East of the old lighthouse on Middle Island. Between it and Middle Island is a small rocky passage, with from 2 to 12 ft. water.

Immediately behind Point Pickering is the mouth of the *Merri River*, which ordinarily may be stepped across, but floods wash the sand from its mouth, and cause the discharge of a large body of water.

Warrnambool Harbour is protected to the south-eastward by a *bar* of $3\frac{1}{2}$ to 5 fathoms water, which adjoins and extends from a rocky patch awash at high water, lying South 3 cables from Hopkins River heads.

Much agricultural produce is exported from Warrnambool, which had a population of 4,839 in 1882. There are two sets of moorings in the harbour, one in

3½ fathoms, the other in 13 ft.; to the end of each chain a red mooring buoy is attached. At 2 cables North of the mouth of the Merri River a jetty is built out into 12 ft. water, to a distance of 860 ft. from the shore, and a *green* light is exhibited on its extremity. There is a *lifeboat* station at the jetty.

It is proposed to construct a breakwater here to improve the harbour. In order to prevent vessels going too near where the blocks have been deposited. a black buoy is placed in 3½ fathoms, about 2½ cables S.E. of the green light on the jetty.

The South channel, which is the best entrance into Warrnambool Harbour, has in its centre two rocky patches of 28 and 29 ft., over which the leading lights when in line lead. The bottom of the whole channel is rocky and uneven, varying from 9 fathoms to 28 ft., but in which a depth of 6 fathoms might be maintained.

A stranger bound to Warrnambool Harbour from the westward or southward will be greatly guided as to his position by *Tower Hill*, which is only 3 miles from the coast, and 7 miles West of Warrnambool.

Vessels entering Warrnambool Harbour from the westward or southward, should first sight the *red* light (carefully avoiding the 17-ft. patch which lies S.S.E. half a mile from Middle Island), and then bringing it in line with the *bright* light, bearing North, steer in between the 5-fathoms bank and the foul ground S.E. of Breakwater Rock until the *green* light on the jetty is opened, when steer in for it and anchor. From the eastward, either bring the marks above described on, or cross the bar to the south-eastward, taking care not to shut the *bright* light in when standing towards the mouth of Hopkins River.

It is not safe to enter or leave the harbour in south-westerly or southerly gales. In bad weather, or with a heavy southerly swell, the sea breaks at a distance of a mile from the land. It is high water, on full and change, at $0^h\ 37^m$; springs rise about 3 feet.

PORT FAIRY is 14½ miles westward of Lady Bay. For 7 miles on either side of Port Fairy the coast is low, that to the westward having grassy slopes with a few scattered trees, whilst that to the eastward is composed for the most part of bare sand hummocks about 60 ft. in height. In making this port from the southward, the first remarkable land seen will be Tower Hill, 300 ft. high, lying 7 miles N.E. ¼ N. from Griffith Island, which extends from the land in a north-easterly direction, and forms Port Fairy. *Belfast*, at the mouth of *Moyne River*, with a population of 1,757 in 1881, is the town of Port Fairy. There is telegraphic communication between Belfast and all the Australian colonies, as well as Tasmania.

Helen Rock, of 1 fathom, lies E. ¼ S. 2½ miles from Sisters Point, the eastern entrance point of Port Fairy, and S. by E. ½ E. from Tower Hill. The rock is 1 mile from the shore, has 8 or 10 fathoms close-to on all sides, and is of so pinnacle a form that a lead would not rest upon its summit. It rarely breaks, and is much in the way of coasters.

Light.—A red circular stone lighthouse stands on the eastern part of Griffith Island. It is built nearly at high-water mark, and from it is exhibited a *fixed red* light, varied by a *flash* every *three minutes;* the light is elevated 41 ft., and visible 9 miles. Within 3 miles it appears as a *fixed* light. A lower *bright* light is shown over the anchorage.

On *Look-out Hill*, a *fixed green* light, visible 3 miles, is shown between North and E.N.E. In approaching from seaward, this light may be steered for as soon as seen, and anchorage taken up as convenient.

From the lighthouse on the East point of Griffith Island, to the East and N.E., a reef, dry at low water, extends a cable off. Also from the same point, in a N. by W. direction, a reef extends more than 3 cables, with 7 and 10 ft. near the northern extreme, and in no place exceeding 15 ft. At this extreme a *black buoy* is moored in 17 ft., with the Custom House just open of the end of the jetty, bearing W. by S. $\frac{3}{4}$ S., and the lighthouse S. by E.

Back Pass, a narrow but bad boat channel between Griffith Island and the mainland, has a bar of 6 ft., outside which the depth rapidly increases to 10 fathoms.

Moyne River flows into Port Fairy, and on a hill on the eastern bank, 38 ft. high, and close to the river's mouth, stands a flagstaff. Extensive works are in progress to improve the channel, and vessels drawing 10 ft. can now reach the town wharves. On the end of the southern dike is a *fixed light*, visible 3 miles; it is cut to show *red* to clear the black buoy off the river entrance, round westerly, over the foul ground to Griffith Island, and *bright* over the river entrance.

At $1\frac{1}{2}$ cable to the northward of Moyne River entrance is a *jetty*, extending 2 cables into 7 ft. water; but it can seldom be used except as a landing place. A *lifeboat* is stationed at the jetty.

The anchorage for large ships is in 5 to 6 fathoms, off the tail of the reef extending from the N.E. point of Griffith Island, with the lighthouse bearing S. $\frac{3}{4}$ W., and the flagstaff in line with, or a little open northward of, the end of the jetty, S.W. $\frac{3}{4}$ W. There are three sets of moorings in the port.

After making out the hill on Griffith Island, steer so as to clear the reef which extends from the lighthouse, then haul up for the anchorage, for which the flagstaff in line with the jetty is a good mark, or make fast to the moorings.

It is high water at Port Fairy, on full and change, at 0^h 31^m p.m.; ordinary springs rise 3 feet.

CAPE NELSON, 30 miles westward of Port Fairy, is a cliffy head, 200 ft. above the sea, rising to a hill 459 ft. high, $1\frac{3}{4}$ mile to the northward. Cape Nelson is bold of approach to the south-eastward.

LIGHTHOUSE.—Notice was given in 1883 that a light would shortly be shown from a stone lighthouse, 79 ft. high, on the southern extremity of Cape Nelson. The light will be *fixed bright*, elevated 249 ft., and visible 19 miles seaward through an arc of 180°.

From Cape Nelson the land trends northerly for nearly 3 miles, and thence East for 2 miles, where it suddenly turns S.E. to the promontory named *Cape Sir William Grant.*

Point Danger lies N.E. ¼ E. from the last-mentioned cape, forming a bight between, outside of which, and at a distance of two-thirds of a mile South of the point, is a reef, with only 16 ft. water.

PORTLAND BAY may be said to extend from Point Danger N.E. ¾ N., 12 miles to Fitzroy River. In the depth of the bay off the town of Portland there is good anchorage, sheltered from all but south-easterly gales, which seldom occur.

From Point Danger the S.W. shore of Portland Bay trends N.W. by N. ¼ N. 1 mile to *Blacknose Point*, and thence in the same direction nearly 2 miles to the lighthouse on Observatory Hill. The land about Portland, except that upon which the town stands, is not good for agriculture, the products of which are consequently small. Its exports are wool and agricultural produce. There is telegraphic communication between Portland and all the Australian colonies, as well as Tasmania, and it is connected with Melbourne by railway.

There is ample jetty accommodation for the loading and discharge of vessels, and the harbour will eventually be much improved by the construction of a breakwater, which will run out a distance of 1,000 yards from the shore.—*Australian Handbook*, 1884.

The Light on Observatory Hill is a *fixed* light, showing *red* when bearing between N.W. ¾ W. and S. by E.; inshore of S. by E. it changes to *bright;* it is elevated 105 ft., and should be visible 13 miles, but being of a deep red colour it is often so indistinct that the ordinary town lights are first seen.

From the lighthouse on Observatory Hill the coast trends W.N.W., nearly half a mile to the entrance of Wattle Hill Creek, and thence curves to the northward along the front of the town of Portland to Whalers Point, which is 1¼ mile N.W. by N. ¼ N. from the lighthouse.

Near the centre of the bay is a jetty, which runs out 1,000 ft. into 17 ft. water. A *green* light is exhibited from this new jetty, but it can scarcely be seen from the anchorage. A *lifeboat* is stationed at the jetty.

Whalers Point or *Look-out* is a limestone cliff, 107 ft. high, off which a reef of rocks extends a quarter of a mile, with only 7 ft. on its outer and shoalest part. There is no channel over this reef. East of the point on the tail of the reef a *chequered buoy* is moored in 3½ fathoms.

The best anchorage is in about 6 fathoms, half a mile from the shore, with Lawrence Rock open of Point Blacknose S.E. ½ S., and in a line with the new jetty, but vessels may anchor where most convenient, only preferring the southern shore. A red mooring buoy a little inside of this position will be a guide to the anchorage.

At about 34 miles N.W. by W. of Cape Nelson, is the mouth of *Glenelg*

River, on the western side of which is the marked boundary line between the provinces of Victoria and South Australia, in long. 140° 58′ 7″ E.

THE COAST OF SOUTH AUSTRALIA.

CAPE NORTHUMBERLAND, 45 miles W.N.W. of Cape Nelson, is a prominent headland, which, independently of Macdonnell lighthouse standing on it, may be easily known in the daytime by Mounts Gambier and Schanck, to the northward of it.

LIGHT.—The lighthouse on Cape Northumberland is a tower 28 ft. high, painted white with a central red band, standing 418 yards eastward of the old lighthouse, which is in lat. 38° 3′ S., long. 140° 37′ 45″ E. The light is *bright*, and *revolves* every minute, elevated 150 ft. above high water, and visible 20 miles. Vessels passing this lighthouse will be reported at Adelaide free of expense, on showing their numbers.

Vessels approaching Cape Northumberland from the north-westward should never sight the light on a bearing more southerly than E. ½ S., and on seeing the light should alter the course more southward, so as to give a good berth to the outlying reefs westward of the cape, which run parallel with, and extend 1 mile from the shore.

Vessels from the eastward should not bring the light to bear to the westward of W.N.W., and when it becomes visible on that bearing should steer more southerly, in order to give a wide berth to the reef which stretches to the eastward from Cape Northumberland.

The coast north-westward of Cape Northumberland is low, and owing to the heavy ocean swell which sets directly on shore should be very carefully avoided. A current has also been found setting towards the land between Capes Northumberland and Jaffa.

A vessel off the coast between Cape Jaffa and Cape Northumberland, when in soundings of 45 fathoms and upwards, is in a position of safety. It is therefore recommended that masters of vessels, during night in thick weather, or in doubt, should verify their position by sounding.

Port Macdonnell, lying on the shore 2 miles eastward of Cape Northumberland, is the township and port for the surrounding agricultural district; it has a jetty, 1,060 ft. long, where boats can unload, a lifeboat and rocket apparatus, and a telegraph office. No vessel should attempt to anchor, owing to the flat rocky nature of the bottom. There are five sets of moorings, which represent the total possible accommodation for shipping. A blue flag is hoisted when it is unsafe for vessels in the offing to come in, or for boats to land.

It is necessary to have daylight to enter. From the westward, with Cape

Northumberland North 2 miles distant, steer E. ½ N. until Mount Gambier, 630 ft. high, is seen over the right or eastern fall of Mount Schanck, 380 ft., bearing North, the depth will then be 6 fathoms. Go in with the above leading mark on; it leads directly to the moorings, the water gradually shoaling; 14 feet will be the least passed over.

LIGHTHOUSE.—On *Carpenter Rocks Point*, near *Cape Banks*, is a lighthouse, with a *revolving* light, showing alternately one *red* and two *bright* faces, at intervals of 20 seconds each. The light is elevated 92 ft., and the bright light should be visible 10 miles, the red light 8 miles. Lat. 37° 54′ 15″ S., long. 140° 23′ 10″ E.

Rivoli Bay is an indentation near the middle of the sandy coast extending between Cape Banks and Guichen Bay. At the North end of the bay is *Beachport*, off which there is anchorage, sheltered from West and S.W. winds. A *red* light is shown on the jetty.

Light.—On *Cape Martin*, *Penguin Island*, the N.W. point of Rivoli Bay, is a white lighthouse, with a *flashing bright* light, showing a flash every 10 seconds, elevated 80 ft., and visible 12 miles.

Guichen Bay is the bight, 2½ miles in depth, included between Boatswain Point and Cape Dombey, the latter of which lies 24 miles N.W. ½ N. from Cape Martin. The bay has soundings of 4 to 6 fathoms all over it. The trade is carried on by a steam-vessel, which makes weekly visits. The anchorage is open to the north-westward.

Robe Town is picturesquely situated three-quarters of a mile S.E. of Cape Dombey, and has a jetty, 1,020 ft. long, where boats can generally load. There are moorings for the steam-vessel calling here in 3 fathoms off the jetty. A lifeboat is attached to the port, and a rocket apparatus for saving life from wrecked vessels. There is telegraphic communication with Port Adelaide, and fresh water and provisions may be obtained. No vessel should attempt to enter Guichen Bay at night.

One Tree Hill, which is the N.W. summit of a low range 120 ft. high, and 2 miles S.E. by E. from Cape Dombey, bearing S.E., or in line with the first rocky point East of Robe Jetty, clears the Black Pigs, Snewin Rock, and South Reef; passing 1 mile S.W. of the first, and half a mile N.E. of the second danger. It should be kept on until Cape Dombey bears South, then steer S.E. by E. ½ E. for the anchorage, which is in 4 fathoms, fine sand, with the extreme of Cape Dombey W. by S. ½ S., and the jetty end S.S.W. During the first five months of the year, when south-easterly winds prevail, it is safe to anchor in Guichen Bay; with N.W. and westerly winds, or from June to December, the anchorage is unsafe.

CAPE JAFFA and LIGHTHOUSE.—Cape Jaffa (or *Bernouilli*) is a low sandy point. The rock on which the lighthouse stands is the only one above water of the extensive *Margaret Brock Reef*. It is awash at high water, and bears W. ½ S. nearly 4 miles from Cape Jaffa.

The lighthouse is built on iron piles screwed into the rock, painted black, and rises to a height of 100 ft. above the sea. The light is *bright*, *revolving* every half minute, and visible 13 miles.

Lacepede Bay is formed by the bight in the coast between Cape Jaffa and Granite Rocks. It is a remarkable fact that this bay, although apparently exposed to the ocean swell, affords safe anchorage for the largest vessels in all weathers. The township of *Kingston*, or *Port Caroline*, on Maria Creek, is 11 miles N.E. of Cape Jaffa, and is the western terminus of a railway now in progress. A pier, 4,000 ft. long, extends into 14 ft. water. It is likely to become a place of importance, having the safest and most commodious anchorage between Melbourne and Adelaide, and may be recognised by a wide gap in the trees, there being none between the township and Maria Creek; a large white store near the beach is conspicuous from the offing when the afternoon sun is shining on it. At night a *fixed bright* light, elevated 25 ft., and visible 10 miles, is shown on the end of the iron pile jetty.

From the southward or westward.—In rounding Margaret Brock Reef, do not shoal the water to less than 15 fathoms; this depth will be found rather more than 2 miles to seaward from any part of the shoal. With the lighthouse bearing East, distant 3 miles, steer N.N.E. until the lighthouse bears S.E. by S. $\frac{1}{4}$ S. The North extreme of the reef will then bear S.E. by E. $\frac{1}{2}$ E. 2 miles. From here to the anchorage off Kingston is N.E. by E. $\frac{1}{4}$ E. 13 miles.

The anchorage for large vessels is with the jetty bearing E. by S. 2 miles, in $4\frac{1}{2}$ fathoms, sand and weed; and for small vessels in 2 fathoms, with the jetty bearing E. by S., 7 cables distant. There is a bank, with $2\frac{3}{4}$ fathoms on it, half a mile S.S.W. from the first position; to the West and North the water is deeper. A chequered buoy was placed on a 10-ft. patch lying $1\frac{3}{8}$ mile W. by S. from the inner end of the jetty, and just in the track of vessels. The anchorage in the southern part of the bay, where vessels usually ship wattle bark, is for large vessels, with Cape Jaffa S.S.W. nearly 2 miles. A vessel may anchor with safety, according to her draught, anywhere between Kingston and Cape Jaffa, inside the 5-fathoms line, by the chart. There is, however, a sandy spit extending from the beach at $6\frac{1}{2}$ miles S.W. from Kingston Jetty.

It is high water in Lacepede Bay, on full and change, at $0^h\ 6^m$; springs rise 5 feet.

Murray River.—The sea mouth of Murray River is on the North side of Encounter Bay, and has a bar across it on which there is about 7 or 8 ft. at low water, but on account of the break only light draught vessels can enter, with the aid of a pilot, or under the guidance of a master well acquainted with the locality. Tidal Signals are shown at the entrance, and a *lifeboat* is stationed here. *Goolwa*, on the West bank of the Murray River, at 7 miles from its mouth, is connected by tramway with Port Victor, $10\frac{3}{4}$ miles distant.

Port Victor, 64 miles South of Adelaide, and about 12 miles westward of Murray River entrance, lies on the shores of *Victor Harbour*, and is a shipping

port for wool, &c. There is an iron jetty here reaching into 26 ft. at low water, and a breakwater, 2,000 ft. long, is in course of construction from the N.E. corner of Granite Island. The anchorage is not good, but heavy moorings have been laid down northward of Granite Island, which is connected with the mainland by the jetty. A pilot is necessary for entering the harbour.

A *fixed bright light*, visible 5 miles, is shown on the extremity of the breakwater. Vessels from the S.W. should not steer towards the port till this light bears N.W., and by keeping it on that bearing should pass about 2½ cables eastward of *Seal Rock*, lying 2 miles N.E. by E. ½ E. from Rosetta Head.

BACKSTAIRS PASSAGE, the eastern entrance into the Gulf of St. Vincent and Investigator Strait, is bounded to the south-westward by the coast of Kangaroo Island, from Cape Willoughby to Kangaroo Head, and to the north-eastward by Cape Jervis, a prominent headland, bearing N. by W. ¼ W., distant 13 miles from Cape Willoughby, and having a ledge of rocks, which extends about 2 cables from its northern point. This passage is 12 miles long, N.W. by W. and S.E. by E., and 7 miles wide, between Cape Jervis and Kangaroo Island.

CAPE WILLOUGHBY and Sturt Light.—Cape Willoughby, the East extremity of Kangaroo Island, is a bold rocky headland, 173 ft. high, on the summit of which stands Sturt lighthouse, in lat. 35° 51′ 9″ S., long. 138° 9′ 38″ E. The tower, which is white, is 75 ft. high, exhibiting a *revolving bright* light, attaining its greatest brilliancy every 1½ minute, elevated 247 ft. above high water, and visible 24 miles, when bearing between N.E. and S. by E. ¼ E., round by North and West.

There is a Telegraph Station near the lighthouse, from which vessels are reported at Adelaide free of expense, on showing their numbers. The masters of vessels entering, with passengers on board, are requested to signal as to any and what description of sickness has occurred during the passage.

The Pages are a rocky group, lying N.E. by E., between 8 and 10 miles from Cape Willoughby. The North Page, the largest of the group, is a rocky islet, 60 ft. high, and may be seen at a distance of 11 miles from the deck of a moderate-sized vessel. South Page is of nearly equal height with the northern islet, from which it lies S. by W. 1¼ mile. There is a channel between these two islets 1 mile wide, having 10 fathoms, which is quite safe with a commanding breeze.

Yatala Shoal is 3¾ miles long, N.W. and S.E., and a quarter of a mile wide, shoaling gradually from 9 fathoms at its edges to 3 fathoms on its centre. From the shoalest part Cape Willoughby lighthouse bears S. by W. 6¾ miles, Cape Jervis N.W. ¾ N. 7¼ miles, and the South Page E. by S. ½ S. 6¼ miles.

From Cape Willoughby the coast trends in a N. by W. direction 2½ miles to *Cape St. Alban*, and at about half a mile south-eastward of the latter cape, and North 2 miles from the former, is *Scraper Shoal*, having a passage 1 cable wide between it and the shore.

The least water on this shoal is 13 ft., distant 4 cables E.S.E. from Cape St.

Alban, with Cape Willoughby lighthouse bearing S. ½ E. 2¼ miles. The depth on the shoal varies according to the season. The centre of the Telegraph Station, 89 yards from Cape Willoughby lighthouse, kept in line with the lighthouse, leads about 3 cables outside or eastward of Scraper Shoal in 7 fathoms at low water.

Backstairs Passage presents to the navigator but few difficulties to overcome, it being, with ordinary care, navigable for vessels of any size or draught; and as there is a clear channel nearly 4 miles wide on the S.W. side, and another 3 miles wide on the N.E. side of Yatala Shoal, the chart will suggest the best route. If, on coming from the eastward, and bound up the Gulf of St. Vincent, night should be approaching, keep on the North side of the passage, and haul round Cape Jervis, all that coast being quite bold. To clear the rocks off Cape Jervis, keep Sturt lighthouse shut in by the high land of Cape St. Alban. When the gulf is open, and the vessel is about 5 miles north-westward of the cape, a N. by E. ½ E. course may be steered for the lighthouse at the bar of Port Adelaide.

At Night, when proceeding from the southward, Sturt light should not be brought to bear to the southward of W. by S. ½ S., until quite certain of passing well eastward or westward of the Pages Islets. By keeping within 3 or 4 miles of the coast of Kangaroo Island, these islets are easily avoided; Yatala Shoal and the rocks off Cape Jervis will be cleared by shutting in Sturt light behind Cape St. Alban. Cape Jervis light first opens out on a N. ½ W. bearing.

As in deeply-laden ships it will be impossible to beat through Backstairs Passage in one tide, it is always prudent, when bound out against southerly winds, to wait during the flood in Antechamber Bay, between Cape St. Alban and *Cape Coutts*, 3¾ miles to the N.W.

CAPE JERVIS, which forms the S.E. entrance point of the Gulf of St. Vincent, is a high bold headland, having but little vegetation. It is intersected by gullies, and has several cliffy projections. There is a *signal-station* on the cape, by means of which vessels can be reported.

Cape Jervis Lighthouse shows a *fixed bright* light, visible from seaward when bearing between S.S.W. and N. ½ W., and in clear weather should be seen from a distance of 13 miles. The position of the tower is in lat. 35° 37′ S., long. 138° 7′ 30″ E. The outer extremity of the reef, projecting from Cape Jervis, lies 1,600 ft. to the S.W. of the lighthouse.

THE GULF OF ST. VINCENT is formed between the East shore of Yorke Peninsula and a range of moderately elevated hills, which extend to the northward, in continuation of those over Cape Jervis. The breadth of its entrance between that cape and Troubridge Hill, which bears N.W. from it, is nearly 34 miles; and in this space there are regular soundings in 18 to 20 fathoms, which decrease to 12 and 11 on approaching within 4 miles of Troubridge

Shoals, and afterwards deepen to 22 in mid-channel to the eastward. On the eastern shore of the gulf, abreast of these shoals, there are some patches of cliffs, with 20 fathoms at 9 miles West from them, and 15 fathoms within 3 miles. From the centre of the entrance the gulf extends nearly 80 miles to the northward, gradually decreasing in width from the entrance to the head of the gulf.

Glenelg Jetty, connected with Adelaide by a railway 6½ miles long, is 43 miles N.N.E. from Cape Jervis. On it, in latitude 34° 59′ 30″ S., longitude 138° 30′ 30″ E., is a *fixed red* light, 29 ft. high, visible 6 miles off. The jetty is 1,356 ft. long, with 11 ft. water at the end, at low springs. It is furnished with cranes, a tramway, &c., and is principally used as a landing-place for the mails. Glenelg is a coaling station for the mail steamers, and is much used as a sea-side pleasure resort.

A schooner is moored in 6¼ fathoms, 1¾ mile West of Glenelg Jetty, and two *fixed bright* lights are shown from it. This vessel will probably be removed shortly.

Holdfast Bay is an open roadstead off the town of Glenelg, having gradually decreasing soundings from 7 fathoms, at 2 miles, to 2 fathoms at a quarter of a mile off the jetty. The anchorage is in 5 or 6 fathoms, clay, at 1½ to 2 miles from the shore, with the light or flagstaff in line with Mount Lofty, bearing E. ½ N. South-west gales cause a heavy sea in this roadstead; but as the holding ground is good, vessels may ride in perfect safety, if provided with good anchors and cables.

PORT ADELAIDE.—From Glenelg the sandy beach trends nearly N. by W. ½ W. 8 miles to Malcolm Point, near the South extreme of Lefevre Peninsula, and from thence 1 mile northward to the flagstaff, and pilot and telegraph stations of Port Adelaide. There is 5 fathoms at 1 to 1½ mile from the shore, between Black Cliff and Malcolm Point.

At the end of the *Semaphore Jetty*, which projects about 630 yards from the pilot and telegraph stations, is a *fixed green light*, 27 ft. above high water, and visible from seaward, when bearing from N.E. by E. ¾ E. round by East to S.E. by S., at a distance of 5 miles. The light is obscured eastward of the latter bearing in order to keep vessels a mile westward of the sands at the outer bar of Port Adelaide Creek.

A *fixed red* light is shown from the hulk *Fitzjames*, moored in Semaphore anchorage.

Signals.—1st. All vessels arriving from over-sea ports, within 5 miles of the Semaphore Station on Lefevre Peninsula, between daylight and dark, or after dark at day-break, shall hoist the following signals :—

1st. The national ensign at the peak or ensign staff.
2nd. The ship's number by Commercial code.
3rd. The port from whence she arrives.

Wonga Shoal, of which Semaphore Spit forms the N.W. extreme, consists of sand, and extends W.N.W. 1¼ mile from the end of the Semaphore Jetty to the spit. A *red* bell buoy, shaped like a boat, with a staff and ball, is placed, in 17 ft. water, on its northern extremity. This shoal forms a natural breakwater for the deep water space directly North and N.E. of it, when the wind is between S.W. by W. and South. Between Wonga Shoal and the outer bar the bottom is all sand and weed, and the holding good. From the Bell Buoy the water shoals gradually in a S.E. direction towards the shore.

The Bell Buoy should be left to the southward and eastward; but small vessels may cross the shoal, in not less than 12 ft. water, to the southward of the buoy, and bringing the Semaphore light to bear E. by S. ¼ S., may anchor, according to draught of water, off the jetty. Large vessels should avoid crossing the shoal southward of the buoy, by not bringing the jetty light to bear to the eastward of S.E. by E. ½ E., and not standing farther in than to have the lighthouse bearing N. ¼ E.

Lights.—A *bright* light, *revolving* every half minute, is shown from a red iron tower 65 ft. high, and surrounded by piles, erected in 7 ft. water, on the South side of the outer Bar Channel of Port Adelaide Creek, near the end of the South Sand. The light is visible 17 miles, or at a greater distance in warm weather, when much refraction exists.

Twelve lights are exhibited from beacons erected in Port Adelaide Creek to mark the channel; vessels entering must leave them all on the starboard hand.

Two leading lights, 217 yards apart, the upper *red* and the lower *bright*, are shown at the entrance, and in line N.E. by E., nearly, they lead over the outer bar, midway between the bar buoys. These lights should be kept in line until within half a cable of the bright light, when No. 11 beacon light can be steered for.

The best anchorage for large vessels is in 4½ to 5½ fathoms, sand, anywhere northward of the Bell Buoy, with the lighthouse bearing N.E. to N.E. by N., and the jetty light from E.S.E. to S.E. by E. Vessels waiting for orders will find it convenient to anchor tolerably close to the buoy; whilst those only waiting for tide to pass the bar, should anchor with the jetty light bearing S.E. and the lighthouse from N.E. by N. to N.E. by E. Small vessels may anchor inside the Bell Buoy, with the lighthouse bearing from N. by E. to N. ½ W. and the jetty light from E. by S. to E.S.E.

The anchorage near the lighthouse is very good, and a ship may ride out any gale with a single anchor if a sufficient scope of chain, not less than 70 fathoms, be given.

From the Semaphore Jetty the sandy beach trends in a N. ½ E. direction 4½ miles to the N.W. point of Lefevre Peninsula, forming the eastern side of the entrance to Port Adelaide Creek, and is fronted by flats and shoal water, which at 2¾ miles northward of the jetty, project more than a mile from the shore. At a mile northward of the Semaphore Jetty, a private company has erected a

new pier in *Largs Bay*, across the flats, to form an outer harbour where ships of the largest tonnage can lie in all weathers. The pier is 1,850 ft. long, reaching into 19 ft. water, and is connected with the railway.

It has been proposed to construct a large dock of nearly 30 acres area, for ocean-going vessels, on the East side of the entrance to Port Adelaide Creek. It would have a depth of 30 ft., with an easy approach.

PORT ADELAIDE CREEK, which separates Lefevre Peninsula from Torrens Island and the low land extending from the foot of the Mount Lofty range towards the sea, leads from the roadstead to the port, which, following the reaches of the creek, is distant 8 miles.

From the entrance over the outer bar the channel trends 2 miles in a general north-easterly direction to within 2 cables' lengths of the N.W. point of Lefevre Peninsula, and from thence sweeps round eastward and southward 1 mile to *Snapper Point*, the N.E. extreme of the peninsula, on which is a white-topped spar beacon, marking the observation spot, which is in lat. 34° 46′ 51″ S., long. 138° 31′ 0″ E.

Between the Outer and the Inner bars, a distance of 2½ miles, the channel with 14 to 24 ft. is from 400 to 1,000 ft. wide. The West side is marked by *black* buoys and beacons for about 1½ mile; the East by *red* ones as far as the South end of the cutting over the Inner bar.

The Inner bar has an artificial channel cut through it 9,250 ft. long, and from 160 to 280 ft. wide. In 1883 notice was given that the least depth in this channel was 18 ft. at low water springs, and that there is now not less than that depth between the Outer bar lighthouse and Port Adelaide.

Dredger Signals.—A *red* ball denotes leave the dredger on the starboard hand, a *black* ball leave it on the port hand. In going in at night a *red* light under a *bright* light denotes leave the dredger on the starboard hand, a *green* light under a *bright* light leave it on the port hand.

Tides.—It is high water at the Semaphore and at the lighthouse on the Outer bar at the same time, $4^h\ 40^m$. It is high water at the Semaphore from 30 to 90 minutes—on the average 50 minutes—before it is at Port Adelaide. The smaller difference happens with S.E. winds, the latter with strong N.W. winds. It is high water on the Inner bar at the same time as at Port Adelaide.

The average rise of spring tides is about 8 ft. above the datum, and neaps 5 ft., both these being the high tides of the day. Strong N.W. winds raise the general level of the water 2 to 3 ft.; continuous S.E. winds depress it about 1½ ft. The greatest rise of the tide occurs in May, June, and July. The ebb runs to the southward and the flood North, between Wonga Shoal and Outer bar. The greatest strength of surface current found running between the Semaphore and the Outer bar is less than 1 knot per hour. It ought to be thoroughly understood that the tidal signals at the Semaphore now show the

rise and fall of the tides between False Arm and the harbour only. Previous to January, 1883, they showed the depth on the Outer bar.

Winds.—During the whole summer, and with fine weather in the winter, the wind is blowing off the land all night as a rule. It veers to the northward about daylight, and either remains there or falls calm until the flood tide makes, when the sea breeze comes up from the S.W., and veers to the southward and S.S.E. by sunset.

The heaviest gales occur in May, June, July, or August. Forty-eight hours is usually the extreme limit of the time they blow from between North and S.W., and not more than eight of these gales occur during the bad weather season.

The Township of Port Adelaide is of considerable size, and has more than a mile of wharfage, the depth alongside varying from 11 to 19 ft. (1876). There are three patent slips on the North side of the creek. There is a good macadamized road and railway of 7½ miles between the port and Adelaide. Tramways are laid down from the railway terminus and fresh water along the wharfs, so that a vessel can water alongside. Port Adelaide is in telegraphic communication with Victoria, New South Wales, Queensland, Tasmania, and all parts of the colony; also viâ Adelaide and London line, with Great Britain, America, China, &c.—*Sawtell's Nautical Almanac.*

There are two docks (one opened in September, 1880) at the N.E. end of the town; and the wharfage, which is being increased, has now an extent of about 4,300 yards along the river. Vessels drawing 20 ft. can reach the wharves.

Directions.—Vessels entering the Gulf of St. Vincent may sight from a considerable distance, the high range of hills on the eastern side extending from the southward to Mount Lofty, at the northern extremity of some table land. This mount, which is the most elevated part of the range, is 2,330 ft. above the level of the sea, and from Cape Jervis bears N.E. by N. ¾ N., distant 50 miles. For about 18 miles up the gulf the land is high and bold, but above that the shore becomes very low, with sand-hummocks upon it, and the same description of coast prevails to the head of the gulf.

After passing the high coast land the water shoals some distance out, and in some places, within 10 miles of the lighthouse, there is 5 fathoms at 4 miles from the beach. Great attention must be paid to the soundings, especially at night, and in running up for the lighthouse it would be most desirable to keep between 6 and 7 fathoms water, not going into less than 6 fathoms, as within that depth it shoals suddenly. The best mark for Port Adelaide, however, is a red brick chimney, belonging to some copper smelting works, situated close to the bridge at the township. It is visible 12 or 14 miles off at sea in fine weather.

The pilots now board ships from the Semaphore jetty, the cutters formerly used being laid up. Three steam-tugs generally lie off the jetty,

ready to go out to vessels signalling for them by hoisting the ensign at the fore.

A ship bound inward may cross the Outer bar just as the tide has done rising, and giving her a fair allowance of time she will cross the Inner bar still with a rising tide. So that bound in, a vessel crossing the Outer bar at high water has the full advantage of the greatest depth throughout the creek.

A vessel waiting for water to cross the bar, should anchor in 5 or 6 fathoms, with a good scope of cable, and with the lighthouse bearing from N.E. by N. to E. by S.

Signals.—Tidal signals are made from the Semaphore at the pilot station, in reference to the depth of water between False Arm and the harbour.

High water (Outer Bar).—A square *red* flag exhibited at either yard-arm, or at the mast-head.

Low water.—A square *blue* flag, under the outer ball at either yard-arm.

The above signal will be kept flying from the time the tide appears stationary until the signal next after high or low water has been made.

Vessels in sight.—Red balls are shown at the mast-head for vessels in sight.

Time Signal.—At the Semaphore a ball is hoisted halfway up at $12^h\ 55^m$ p.m., close up at $12^h\ 57^m$, and at $1^h\ 0^m$ p.m., Adelaide mean time, it is dropped. Adelaide Observatory is in lat. 34° 55′ 33·8″ S., long. 138° 35′ 19·5″ E., but a later determination by telegraph places it in 138° 34′ 54″ E., or $9^h\ 14^m\ 19{\cdot}61^s$ in time.

R. H. Laurie. 35. Minories, London.

A. Findlay fecit.

SECTION IV.

THE PHENOMENA OF, AND DIRECTIONS FOR, THE SOUTH PACIFIC OCEAN.

In this, the concluding portion of this work, will be found some general but brief remarks on those meteorological influences which govern a ship's course in traversing the ocean. In various portions of the preceding pages different observations on the winds, tides, and currents are given; what remains here is to collect a few general remarks applicable to the entire ocean, as distinguished from the special descriptions which have preceded them.

The navigation of the Pacific generally is of so simple a character, that but little is required, but it may be desirable to insert here the experience of those navigators who have written on the subject.

These remarks will, therefore, be first on the winds, hurricanes, and use of the barometer; then on the currents and tides; and then on the best routes to pursue between the different ports.

CHAPTER XXI.

THE WINDS OF THE SOUTH PACIFIC OCEAN.

This important branch of the navigation of the Pacific has not been clearly understood, or its particulars so well defined, as they are in other parts of the world, where science or commerce have attracted a great number of voyagers, and elicited a far greater extent of observation. In this, as in other points connected with the great ocean, its vast extent operates against the attainment of that minute acquaintance with its phenomena which is so readily attainable in the Atlantic or Indian Oceans. The brief remarks, therefore, which we have to present on this point must be taken rather as generalities derived from the observed facts, or often deduced empirically, than the assertion of any certain laws by which these phenomena are governed. A general law cannot

be established by a single observation, which is frequently the amount of our knowledge; and it is therefore evident that, before any system can be absolutely established, these observations must be greatly multiplied and amply discussed.

The well-known phenomena of the land and sea breezes demonstrate that the winds in the vicinity of land do not follow the same regularity that they do in the open ocean, where their difference of condition is not in operation. Hence the remarks which are applicable to any one latitude are of a very different nature according as they are intended for the vicinity of land or the reverse.

Even small areas of land have a very marked effect on the regularity of the trade winds. The aggregation of minute spots in the coral groups, as in the Low Archipelago or the Caroline Islands, is sufficient, apparently, not only to intercept their regular course, but even to reverse it, as the winds, even in hurricanes and strong gales, frequently blow in opposition, and this not only in a partial manner, but for considerable periods, and over a very great extent. How it is that the land should have such apparently undue influence, or whether it is that the area of one zone of winds sometimes usurps the situation of another (as was supposed by Capt. Cook), are questions yet to be solved.

In a subsequent page we shall speak of those combinations of opposing winds, now known as revolving storms, which are met with in considerable violence in some parts, especially the western regions of the Pacific; our present attention being confined to the winds as they are usually found.

In applying these principles to observed facts in the Pacific, we are under the disadvantage of having so (comparatively) few connected and authentic records of careful observations. Under these circumstances there is a degree of temerity in entering upon the consideration without so far extending the subject as to make it beyond the limits of the present work, already too large. Nevertheless, in later years the industry of research, and the accumulation of data, have sufficed to give us a sufficiently accurate picture of the meteorology of the Pacific Ocean for the ordinary purposes of navigation. This of course is referring to the broad expanse of the ocean; for the respective coasts and countries which border them we have abundant materials.

The ordinary division of the great ocean into the North and South Pacific, in some senses is not applicable to its meteorology, which would rather separate it into three belts—the inner and extra tropical zones—in the former of which the *trade winds* are dominant; and in the latter the *anti-trade* or passage winds, from the westward, the "brave West winds," as they have been called, are permanent. But as the trade winds are separated into those that blow from the N.E. and S.E., the division into North and South will be applicable, because these meet and neutralize each other near the Equator; this neutral line of calms and varying winds being known by the name of

the "Doldrums," an uncouth term, which has had unmerited authority given to it.

Capt. Maury says:—"It has a mean average breadth (around the globe) of about six degrees of latitude. In this region the air which is brought to the Equator by the N.E. and S.E. trades ascends. This belt of calms always separates these two trade wind zones, and travels up and down with them. If we liken this belt of equatorial calms to an immense atmospherical trough, extending as it does entirely round the earth; and if we liken the N.E. and S.E. trade winds to two streams discharging themselves into it, we shall see that we have two currents perpetually running in at the bottom, and that, therefore, we must have as much air as the two currents bring in at the bottom to flow out of the top. What flows out of the top is carried back North and South by these upper currents, which are thus proved to exist and to flow counter to the trade winds."

The belt of calms follows the sun in his annual course, though the limits do not range so much in latitude as the sun does in declination, and generally they pass from one extreme of latitude to the other in about three months. The whole system of wind and calm belts move northward from the latter part of May till some time in August; they then remain almost stationary till the approach of winter, when they commence to go southward, and proceed in that direction from December till February or March.

Owing to the unequal distribution of land and water in the two hemispheres, the relative proportions being in the northern hemisphere 100 land to 150 water; and in the southern 100 land to 628 water; and, owing to the great influence that the presence of land has on the aerial currents, the division of the two wind systems is always to the North of the Equator, that is, the mathematical and meteorological equators do not coincide. Strictly speaking, then, the equatorial calms are not included in the scope of the present work, but as all trans-oceanic navigation must be dependent on the entire systems to be traversed, the general features will be briefly alluded to. The arguments and facts upon which the theory of the wind circulations is based, are given in our "Memoir of the North Atlantic Ocean," Section III., to which the reader is referred. There is much similarity in the wind and current systems of both oceans.

It has been formerly considered that the trade winds blow regularly over the entire breadth of the Pacific, but the accumulation of facts has demonstrated that this is incorrect, and that in the South Pacific especially there is a great variation from this normal condition. The S.E. trade, in fact, is only felt with certainty over that portion where there is no land, or between the meridians of the Galapagos and the Low Archipelago—not one-half its extent. To what cause this is owing is not as yet capable of any very clear explanation, as the small area of the islands which appear to arrest its uniformity would

seem to be wholly disproportionate to such an effect. However, such is the case, and in the details to which the brief remarks which follow are limited, it will be seen that it is so. In the North Pacific, on the contrary, the N.E. trade blows as far as the Marianas, where the regular monsoons supersede it. In the western parts of the South Pacific there are also regular monsoons, though of a less decided character.

The eastern limit of the S.E. trades is that where the effect of the interception caused by the lofty Andes ceases to be felt, which is at 200 or 300 miles off the shore, for along the coast of Peru the wind blows almost constantly from the southward. The ridge of the Andes extends above the limits of the trades, which it is supposed do not reach above 3 miles in vertical thickness.

The S.E. trade is only felt among the archipelagoes lying between the Paumotu Group and the coast of Australia between March and October; during the rest of the year they are replaced by westerly winds, calms, storms, and rains.

The extent of the trade winds in latitude is usually considered to be from 30° S. to 30° N., but these limits are subject to so many variations, that such a statement must be received with great limitations. We have not the means of drawing such a close approximation to a true mean as can be done in the Atlantic Ocean, from the fewer recorded observations, but the following Table is given by the late excellent Ch. Ph. de Kerhallet, of the French Marine, as the result of 92 vessels which have crossed the line between the longitudes of 106° and 147° West.

Table of the limits of the N.E. and S.E. Trades, and the breadth of the interval between them in each month.

	TRADE WINDS.				Breadth of the intervening zone of calms, &c.
	Polar Limit.		Equatorial Limit.		
	Of the N.E. Lat. N.	Of the S.E. Lat. S.	Of the N.E. Lat. N.	Of the S.E. Lat. N.	
	° ′	° ′	° ′	° ′	° ′
January	21 0	33 25	6 30	3 0	3 30
February	26 28	28 51	4 1	2 0	2 1
March	29 0	31 10	8 15	5 50	2 25
April	30 0	27 25	4 45	2 0	2 45
May	29 5	28 24	7 52	3 36	4 16
June	27 41	25 0	9 58	2 30	7 28
July	31 43	25 28	12 5	5 4	7 1
August	29 30	24 18	15 0	2 30	12 30
September	24 20	24 51	13 56	8 11	5 45
October	26 6	23 27	12 20	3 32	8 48
November	25 0	28 39	..	..	..
December	24 0	22 30	5 12	1 56	3 16

It will be seen, according to this Table, that the polar and equatorial limits of the trade winds vary with the season, and remove farther from or nearer to the Equator, according as the sun has North or South declination; and that the breadth of the intervening zones is less in winter than in the summer of the northern hemisphere. In other respects this zone has much resemblance to the corresponding belt in the Atlantic. It is in reality broader on the meridians of 90° to 110° than farther to the westward, those of 120° to 150° W. longitude: that is to say, the breadth of the calm zone diminishes according as you advance westward, precisely analogous to the wind system in the Atlantic, the recent knowledge of which has had such a marked influence on the trans-equatorial voyages.

The term calm-belt is not precisely applicable to the equatorial "doldrums," because besides calms and light airs variable between N.W. and South, by the West, storms, gales, and abundant rain are frequently encountered.

Owing to the land influences before alluded to, the northern limit of this zone is at the mean in lat. 8° N., and its mean southern edge is on 3° N.

But it sometimes occurs that the two trade winds meet each other without any intervening space of variables or calms.

These few general remarks will give the mariner an insight into those causes which govern the track of a vessel in crossing those oceans to enable him to make the best voyage, by avoiding the contrary, and using the favourable winds. In crossing the equatorial belt, a direct North or South course, as far as practicable, will be the best, as it is then traversed with the least distance. The proper meridians for doing so will be discussed in the remarks appropriated to that topic hereafter.

In the *anti-trades*, or extra-tropical winds, in the southern hemisphere, they have that free scope, almost around the globe, which has had such a marked influence on the passage of ships round the great southern capes, and which within a few years has, by availing them of their certainty and persistence, tended to shorten so materially the voyage from the Antipodes to Europe.

A few words here are only necessary. As far as the antarctic circle, from the southern edge of the S.E. trade, these westerly winds will be found with more or less force and irregularity at all seasons, remembering that, like other winds, they blow towards the sun, that is frequently to the southward of West in the winter, and more to the northward of West in the summer, of the southern hemisphere. These questions will be discussed more at length when the voyage from West to East around Cape Horn is described, as will those more important portions of its area around Cape Horn and the southern parts of Australia.

Within the antarctic circle it is probable, for our data is scanty, that the summer winds blow either East or West, without any great regularity or constancy.

In the ensuing remarks on the peculiarities of the wind systems in the Pacific, we shall follow the geographical order in which the book itself is arranged,

commencing with the Strait of Magalhaens and Cape Horn; then the West Coast of South America; thence proceeding westward over the ocean. The preceding remarks being considered introductory to what follows.

Strait of Magalhaens.

Westerly winds are the most prevalent throughout the year, and at the eastern end of the strait there is generally a strong breeze with heavy squalls between N.W. and S.W. Rain occurs while the wind is northward of West; and usually clear bright weather, with the sun out, when the wind draws southward of West. With the wind at N.W. a decided rise in the barometer is a sure sign of a shift to S.W., which shift invariably takes place before the wind lulls for any time, or fine weather can be expected. The backing of the wind from S.W. to N.W. is always accompanied by a falling barometer.

Easterly winds are certainly more common, and the strait is on the whole less windy in winter (June, July, and August) than in summer, but when against this possible advantage is placed the cold, with the long nights and short days, this season is not likely to be preferred by the mariner in a vessel bound westward. It may be well to mention that ships getting as far as Cape Froward with a S.W. wind, will generally find it N.W. on rounding the cape, as the wind follows the direction of the channel.

Here, as elsewhere, the equinoctial months are the most windy, though the heaviest gales do not always occur at the equinoxes. March is very boisterous, and its gales are usually followed by some fine calm weather in April and May. Towards the middle of May the weather becomes sensibly colder, and the snow, which has been covering the summits of the hills perhaps for some time, will be observed to advance down the slopes; it, however, varies greatly.

December, January, and February, are the warmest months, the mean temperature for several years for these months being 54°; the days are then long, there is some fine weather, and the sun when out has some power. Westerly winds, however, which often increase to violent gales; furious squalls in the western part, accompanied by much rain, are frequent even throughout this season, which, as far as the mariner is concerned, carries with it less of summer than almost any part of the world. Eastward of Sandy Point the weather on shore is very fine, though rather windy, during summer; the temperature is pleasant, the air bracing and healthy. The change between this and the western part of the strait and the northern channels is very marked in this respect. In these latter there were always eight or ten on the *Nassau's* sick list with colds, &c.

Fogs are of rare occurrence and short duration in the eastern part of the strait, though occasionally they set in thick for a few hours, and with no warning during calm weather. Dense fogs have, however, been known to last two or three days at Sandy Point in the winter months. Thick rainy weather is

the ordinary condition of the western part. *Squalls* blow with great force and suddenness all over the strait, making boat work dangerous. *Thunder* and *Lightning* are very rare, indeed scarcely known, except in very bad weather, when violent squalls come from the South and S.W., usually giving warning of their approach by masses of clouds. These storms are rendered more formidable by snow and hail of a large size.

Winds off Cape Horn, etc.

In an early page of this work (page 51) we have given Capt. P. P. King's remarks on this head. By referring to this it will be seen that westerly winds prevail during the greater portion of the year, the East wind occurring in the winter months, and but seldom in the summer. They invariably rise light with fine weather, increase gradually, and sometimes end in a heavy gale, but more frequently do not rise to this strength.

North winds are generally accompanied by thick weather and rain; they always commence moderately, but increasing in strength, they draw to the westward, blowing hardest between North and N.W., the strength of which lasts from 12 to 50 hours, and sometimes shift suddenly into the S.W. quarter, blowing harder than before.

Winds from the S.W. generally last several days, blowing strong, but moderating towards the end. Northerly winds then again commence, and thus constant shifts from North to South, round by the West, are felt during the summer.

Bad weather never comes on *suddenly* from the East, nor does a S.W. or southerly gale shift quickly to the northward. South and S.W. gales rise suddenly and violently, and should be well considered in choosing an anchorage.

This is the sum of the information contained in the passage quoted. But little more need be said here. The constant prevalence of winds between S.W. and N.W. renders the passage round Cape Horn from the Atlantic frequently one of difficulty and hard work. April, May, and June, are perhaps the best months for making the westerly passage. The summer months are preferable for the other direction, but this is so easy as scarcely to require much consideration.

We must not omit to mention the work of the Meteorological Office,* which gives a chart showing the observed direction and force of the wind for each month in the year. From it we learn that the wind has been noticed to blow more frequently from the southward of West in June, July, August, and September, than in other months of the year. We shall refer again to this work hereafter.

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* Contributions to our knowledge of the Meteorology of Cape Horn and the West Coast South America (1871).

Western Coast of Patagonia.

As in the preceding paragraphs, we refer to a former page (page 79) for some remarks on the winds in this portion. They prevail from the N.W. If it blows hard from that quarter, it is very liable to shift round suddenly, and blow heavily from the westward. These do not usually last long. If they veer round to the southward, should the barometer rise, it will clear up; should they back round to N.W. again, and the barometer keep low or oscillate, the weather will doubtless become worse. Easterly winds rarely occur, and bring fine clear weather. Westerly winds, on the contrary, bring constant rain and a quick succession of hard squalls of wind and hail.

The barometer rises with southerly winds, the maximum being with S.E. winds; it falls with northerly and westerly winds, the minimum being at N.W.

M. Lartigue makes the following remarks on the Patagonian winds:—

The winds blow strongly from N.W. to S.W. for about ten months of the year on all the extent of the West coast of America comprised between Cape Horn and the 40th degree of latitude. S.W. winds shift at times to S.S.E.; but those from N.W. come rarely to N.N.E. If the weather should become overcast during calms, which are generally of short duration in these parts, the first breeze which springs up generally comes from North or N.N.E.: it freshens gradually; rain begins to fall; and the weather becomes hazy, principally near the land, where sometimes the fog will not allow objects to be seen at 2 miles distance. The wind continues to acquire strength; and as it freshens it passes round to N.N.W. and N.W.; then the rain diminishes, and the sky begins to get clearer. When the wind gets to N.W. it usually flies quickly to W.S.W., in gusts which are sometimes very violent; other gusts succeed rapidly, and it is then that the wind is strongest. At all times when these W.S.W. winds, that come in gusts, have lasted a certain time, they end by coming round to S.W., and the weather then gets finer; afterwards, though rarely, they pass to S.S.W., and even S.S.E. These latter extreme variations occur particularly near the land and to the S.W. of Cape Horn, where the winds generally preserve the same direction for a longer time than they do to the West of the American continent.

When the N.W. winds have shifted during a gust to W.S.W., if they diminish in strength instead of increasing, as we have before said they will return to the N.W., and pass successively to West and W.N.W. The N.W. winds do not always shift at once to W.S.W.; but they change, sometimes in summer, and very often in winter, by passing to W.N.W. and West; they are then accompanied by rain, but soon changing again to N.W., blow successively in the same intermediate directions.

Winds from W.S.W. to S.S.E. are the only ones which last for any length of time: all those which blow in any other direction are constantly changing.

It is but rarely that S.E. to N.E. winds are felt on this coast; but when they do blow from this quarter, they are almost always violent, and last but a short time. They are generally announced by short intervals of calm, which follow strong W.N.W. winds which have passed in succession to the West, and have been accompanied, as well as the calm, by very abundant rain. The winds from S.E. to N.E., after having blown during some hours, revert to N.N.E., losing their strength, and then get to the North; having got to this quarter, they acquire strength, and are not long before they again pass to the N.W.

When the winds come from the land, the number of inlets and islands existing between the Strait of Magalhaens and the Island of Chiloe have necessarily an influence on their direction. In reality these winds must come from the interior of those bays and channels, and blow in their direction: thus Dampier says that he sailed up this coast with easterly winds, by keeping within sight of land.

But when the winds come from N.W. to S.W., and blow right on shore, they are so strong, that neither the neighbourhood of the land, nor its direction, can make the least alteration; it is then dangerous to approach the coast, particularly in winter.

From the month of October until that of April, that is to say, during summer, the winds from W.S.W. are most frequent; in winter those from N.W. to W.S.W. are so, and these, as have been before stated, are very variable. It blows hard almost always in these parts, particularly in winter. The sea is very heavy, also, in this season of the year; and it is also impossible to make head against a contrary wind without great strain upon the ship.

The winds from S.W. to N.W. being of less strength, and the sea not so heavy in high latitudes as upon the corresponding parallels on the American coast, it will be prudent, at all times when the winds come from the western quarter, to run up to at least the parallel of 60°, and there need be no fear of passing beyond this parallel so long as the wind keeps to the North of West. But if it gets to the South of this bearing, you can then take a N.W. course. It is a general rule that you ought to get to the West, and at as great a distance from the land as possible, before closing with the land and bearing up to the northward; for, in winter especially, you must endeavour to avoid being obliged to keep too close, and even to run 2 or 3 points free, in case the wind should get to the North of West, and approach to N.W.

The difficulties that are met with in getting to westward after having doubled Cape Horn to bear up again along the western coast of America, going from South to North, arise from the strength of the adverse currents which are experienced there, and the heavy sea which they occasion. On the contrary, it is very easy to get to westward on leaving the coast of Peru to go into the Pacific Ocean; everything seems to favour this passage. You will go, by the assistance of the usual winds, to a good distance from the land, and thus avoid all contrarieties in case the wind should get to the South of West.

Chiloe and the Chonos Archipelago.

There is much less difference between the climate, the prevailing winds, and the order in which they follow, the tides, and the currents on the outer coast of Chiloe and at the West entrance of the Strait of Magalhaens, including the intermediate coasts, than persons would suppose who judge only by their geographical positions. North-westerly winds prevail, bringing clouds and rain in abundance. South-westers succeed them, and partially clear the sky with their fury; then the wind moderates, and hauls into the S.E. quarter, where, after a short interval of fine weather, it dies away. Light airs spring up from the N.E., freshening as they veer round to the North, and augment the store of moisture which they always bring; from the North they soon shift to the usual quarter, N.W.; and between that point and S.W. they shift and back sometimes for weeks before they take another round turn. When the wind backs (from S.W. to W.N.W., &c.), bad weather and strong winds are sure to follow. On that coast the wind never backs suddenly, but it shifts with the sun (with respect to that hemisphere) very quickly, sometimes flying from N.W. to S.W. or South in a most violent squall. Before a shift of this kind there is almost always an opening or light appearance in the clouds towards the S.W., which the Spaniards call an eye (*ojo*), and for that signal the seaman ought to watch carefully. As the sudden shifts are always with the sun, no man ought to be taken aback unexpectedly; for, so long as a north-wester is blowing with any strength, accompanied with rain, so long must he recollect that the wind may fly round to the S.W. quarter at any minute. It never blows hard from East, rarely with any strength from N.E.; but an occasional severe gale from S.E. may be expected, especially about the middle of winter (June, July, August). In the summer southerly winds last longer and blow more frequently than they do in winter, and the reverse. The winds never go completely round the circle; they die away as they approach East; and after an interval of calm, more or less in duration, spring up gradually between N.E. by E. and North. Heavy tempests sometimes blow from W.N.W. to S.W.; and those winds, blowing directly on shore, are most to be guarded against.—*FitzRoy.*

Coast of Chile.

The following observations are also by Capt. FitzRoy:—

Very few words will suffice to give strangers to the Coast of Chile a clear idea of the winds and weather that they may expect to find there, for it is one of the least uncertain climates on the face of the globe.

From the parallel of 35° S., or thereabouts, to near 25° S., the wind is southerly or south-easterly during nine months out of the twelve; in the other

three there are some calms and light variable breezes, but the remainder is really bad weather—northerly gales and heavy rains prevailing not only on the coast, but far across the ocean in parallel latitudes.

From September to May is the fine season, during which the skies of Chile are generally clear, and, comparatively speaking, but little rain falls. It is not, however, meant that there are not occasional exceptions to the general case; strong northers have been known (though rarely) in summer; and two or three days of heavy rain, even with little intermission, now and then disturb the equanimity of those who have made arrangements with implicit confidence in the serenity of a summer sky. These unwelcome interruptions are more rare, and of less consequence, to the northward of 31° than South of that parallel; and indeed so nearly uniform is the climate of Coquimbo, that the city is called La Serena.

In settled weather a fresh southerly wind springs up a little before noon (an hour sooner or later) and blows till about sunset, occasionally till midnight. The wind is sometimes quite furious in the height of summer, so very strong that ships are often prevented from working into their anchorages, such as Valparaiso Bay, although they may have taken the precautions of sending down topgallant-yards, striking topgallant-masts, and close-reefing their sails. But the usual strength of this sea-breeze (as it is called, though it blows along the land) is such as a good ship would carry double-reefed topsails to when working to windward.

This is also near the average strength of a southerly wind in the open sea, between the parallels above mentioned; but there it is neither so strong by day, nor does it die away at night. Within sight of the land a ship finds the wind freshen and decrease nearly as much as in the ports, where the nights are generally calm till a land-breeze from the eastward springs up; but this light message from the Cordillera is never troublesome, neither does it last many hours. With these winds the sky is almost always clear; indeed, when the sky becomes cloudy, in summer, it is a sure sign of little or no sea-breeze, and probably a fall of rain; in the winter it foretells an approaching northerly wind with rain.

In summer ships anchor close to the land, to avoid being driven out to sea by those strong southerly winds; but as the winter approaches a more roomy berth is advisable, though not too far out, because near the shore there is always an undertow, and the wind is less powerful. Seamen should bear in mind that the course of the winds on this coast, as in all the southern hemisphere, is from the North round by the West; that the winds which blow the hardest, and bring the most sea, come from the westward of North; and that therefore they should get as much as possible under the shelter of rocks or land lying to the westward, rather than of those which only defend them from North winds. Northers, as they are called, give good warning; an overcast

sky, little or no wind unless easterly, a swell from the northward, water higher than usual, distant land remarkably visible, being raised by refraction, and a falling barometer, are their sure indications. All northers however, are not gales; some years pass without one that can be so termed, though few years pass in succession without ships being driven ashore on Valparaiso beach. Thunder and lightning are rare. Wind of any disagreeable strength from the East is unknown. West winds are only felt while a norther is shifting round, previous to the sky clearing and the wind moderating. The violence of southerly winds lasts but a few hours; and even a northerly gale seldom continues beyond a day and a night, generally not so long.

Some people say that the strength of northerly winds is not felt to the northward of Coquimbo, but there is good evidence of many gales with heavy seas at Copiapo; and Capt. Eden states that he had a very heavy gale of wind in H.M.S. *Conway*, in lat. 25° S., long. 90° W., where such an interruption to the usual southerly winds was little to be expected.

Observations by M. Lartigue.—There are but two seasons to be distinguished on the coast of Chili; the summer, which lasts from the month of October to that of April; and the winter, which is also called the rainy season, which lasts from April until October.

The winds which prevail in summer blow from S.W. to S.S.W.; they approximate to the South, and are more frequent and less strong according as you advance to the northward. These winds are felt in this season up to the 27th degree of latitude, where the general winds are usually met with. The *Clorinde* found, during summer, at a great distance from the land, light winds from South to S.W., and nearer the coast they were rather fresh; from South to S.S.W.

Winds from the North are less frequent and less strong the nearer you approach the tropic; they are sometimes violent, even in summer, at Valdivia; but at Valparaiso they were found to be very moderate. They are rarely felt in a lower latitude than this port.

The winds from the North to W.S.W. are, in winter, the most frequent, and are generally found up to the 27th degree of latitude; and sometimes they are even met with at Lima, which is in lat. 12° S.

At Valdivia the rainy season begins in April; and it becomes later as you advance to the northward. It is not before the end of May that they become frequent at Valparaiso.

In addition to these remarks, all that has been said on the changes which occur in the wind between lat. 40° and Cape Horn is also applicable to this part of the coast; here E.S.E. to N.E. winds are rarely met with. When it blows from North to West much rain falls, but as soon as it is between W.S.W. and S.E. the weather is very fine.

In winter prevalent winds are not found in lat. 21°; between this parallel and that of 27°, light and very variable winds prevail.

The following information is taken from the valuable work mentioned on p. 1077, *note*:—From lat 40° S., sometimes from 45° S., or much further, a southerly wind generally blows along the coast, and eventually turns into the S.E. trade. The wind only fails in June, July, and August, in the first two months of which there is a general westerly wind between 30° and 35° S., in marked contrast to the trade winds close to it, and in August the winds are very light, varying in direction between North round by the West to South. The extension of the southerly wind from the coast is given approximately as follows:—January, to 85° W. in 40° S., to 85° W. in 30° S.; February, to 80° W. in 40° S., to 85° W. in 30° S.; March, to 85° W. in 40° S., to 80° W. in 25° S.; April, to 85° W. in 45° S., to 82° W. in 25° S.; May, to 85° W. in 45° S., to 80° W. in 20° S.; June, to 80° W. in 40° S., to 80° W. in 25° S.; July, interrupted; August, interrupted; September, to 82° W. in 40° S., to 82° W. in 30° S.; October, to 80° W. in 40° S., to 85° W. in 25° S.; November, to 80° W. in 45° S., to 80° W. in 30° S.; December, to 80° W. in 40° S., to 8 5° W. in 25° S.

From March to August off this coast the trade wind extends only to 25° S., during the rest of the year it reaches 30° S. In April, southward of the trades the wind is remarkably unsteady. It appears to be northerly in 30° S., between 90° and 100° W.

Coast of Peru.

On pp. 202—205 is a general account of the weather on this coast, a portion of which we repeat.

The prevailing winds on the shores of Peru blow from S.S.E. to S.W.; seldom stronger than a fresh breeze, and often, in certain parts of the coast, scarcely sufficient to enable shipping to make a passage from one port to another. This is especially the case in the district between Cobija and Callao.

Sometimes during the summer, for three or four successive days, there is not a breath of wind; the sky beautifully clear, and with a nearly vertical sun.

On the days that the sea breeze sets in, it generally commences about ten in the morning; then light and variable, but gradually increasing till one or two in the afternoon. From that time a steady breeze prevails till near sunset, when it begins to die away; and soon after the sun is down there is a calm. About eight or nine in the evening light winds come off the land, and continue till sunrise; when it again becomes calm until the sea breeze sets in as before.

During winter (from April to August), light northerly winds may be frequently expected, accompanied by thick fogs, or dark, lowering weather; but this seldom occurs in the summer months, although even then the tops of the hills are frequently enveloped in mist.

To the northward of Callao the winds are more to be depended on; the sea breeze sets in with greater regularity, and fresher than on the southern parts;

and near the limit of the Peruvian territory (about Payta and off Cape Blanco), a double-reefed topsail breeze is not uncommon.

It is to be remarked, that, although such moderate winds are the general rule on the coast of Peru, yet that sudden and heavy gusts often come over high land after the sea breeze sets in, and, from the smallness of the ports, are attended with some inconvenience, if precautions are not taken in duly shortening sail previous to entering them.

The only difference between winter and summer, as far as regards the winds, is the frequency of light northerly airs during the former months; but in the winter the difference is far greater than one would imagine in so low a latitude. In the summer the weather is delightfully fine, with the thermometer seldom below 70° F., and often as high as 80°, in a vessel's cabin; but during winter the air is raw and damp, with thick fogs, and a cloudy, overcast sky. Cloth clothing is then necessary for the security of health; whereas in summer, the lighter one is clad the more conducive it is to comfort and health.

Observations by M. Lartigue—There are but two seasons on the coast of Peru: summer, from October to April; and winter, which lasts from April till October.

The wind is tolerably fresh in summer; the sky is clear, but it is overcast the moment that the breeze comes off the land, or if it has been calm throughout the day, then the lightest sea breeze dissipates the vapours. In winter the breezes are commonly light; sometimes calms are met with, which, in the neighbourhood of Arica, last for two or three days, but they are of less duration as you proceed to the North or South of that place.

In this season the weather is always cloudy during the night and in the morning; when the sea breeze is at all fresh it clears up, but it again becomes dull as soon as this breeze diminishes in strength.

In approaching Arica during winter, the horizon is very often seen excessively charged with very black clouds, which form a dark band, which sometimes attains a considerable breadth; it is a sign that the breeze in the offing is light; but, as soon as it begins, the horizon clears up directly.

There is constantly, in winter, a very strong swell from S.W. to S.S.W.; when it is very difficult to communicate with the land. The coast is straight, and generally very steep, offering but few landing places for boats, or places where they can be sheltered from the sea, which would otherwise dash them against the rocky shores or on the sandy beaches, and infallibly cause their destruction.

The swell is very much less in summer, and communication is more easy. But little of it is felt at 4 or 5 leagues from land; it is near the land that it is so strong.

It never rains on the coast of Peru; but there are sometimes, during part

of the night and morning, fogs or dews, which are perhaps more effective than light rains.*

Dampier says, in his voyages:—"Rain never falls on the West coast of Peru; the height of the Andes, perhaps, may be the cause. It is likely that the great mass of water falls principally upon the eastern side of these mountains, without reaching their tops, and in the case when it does arrive at this point, perhaps it is arrested by them and dissipated there, and does not extend further off."

The rivers increase in magnitude in the summer, and overrun their banks often in February and March; they are low during winter, and are nearly dry in August and September.

Summer and winter the heat is moderate near the coast, whether at sea or on the land, the thermometer never having risen higher than 82° (Fahr.) during the stay of the *Clorinde* on the Peruvian coast. The nights here are generally cool.

The winds are generally light on all the extent of coast comprehended between the Morro Mexillones and Lima. They blow almost entirely from the southern quarter, but vary according to the direction of the coast, with which they ordinarily make an angle towards the sea of about 22°. In the portions where the coast runs N.W. and S.E., the winds blow from S.S.E., and when it runs North and South they blow from S.S.W.

The breezes are more fresh and more regular when the coast runs North and South. At Arica, as also to the South of this town, where the coast runs North and South, the breeze is ordinarily brisk in the afternoon, and rarely fails.

Almost always it is calm throughout the night and in the morning; but at times, though rarely, a land breeze is experienced.

The sea breeze is not generally felt in the afternoon; the later it rises the more weak it will be found; and at the same time it comes more from seaward. It will then soon drop.

On the contrary, the earlier it arises the stronger and more lasting it becomes; then it follows the direction of the coast, and sometimes even blows from the land; but it is never more inclined than two points with the direction of the shore.

It has been remarked, that at a little distance behind the projecting points,

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* "When astronomers tell us that no water exists on the surface of the moon it is impossible not to feel curiosity as to the appearance which such a surface must present. Those who wish to gratify that curiosity as to lunar scenery should land at Tocopilla. It is a place where there is not the slightest indication that water has ever touched the surface above high-water mark. After careful search I failed to find the slightest trace of vegetation."—*J. Ball, F.R.S.*, "Proceedings of the Royal Geographical Society," October, 1882, pp. 624-627.

where the winds ought to be the weakest, they are, on the contrary, found to be stronger than in the portion where the coast is straight. The more these points advance the fresher the wind is, but they always preserve the same inclination with the general direction of the coast.

Behind the points of Ilo, Ilay, and Cornejo, the S.S.E. breeze is fresh in the afternoon, but to windward and in the offing it has not more strength than on the other parts of the coast. It is the same at 3 or 4 miles to windward of the same points.

The Bay of Lima is closed to the South and West by the low point of Callao and the high Island of San Lorenzo; the breeze here is fresher, and the calms less frequent, than in the anchorages lying more to the South.

The winds from South to E.S.E., though blowing with more uniformity than those of which we have been speaking, are felt in the offing, and at a distance which is subject to variation. On the parallel of Arica they sometimes are not found but at 33 or 40 leagues; but as you proceed northward, they are met with successively at a less distance from the coast. On the parallel of Lima they are found at less than 10 or 12 leagues from land; when you get to the South of Arica they blow at a distance from the coast, which is as much less as you get further off from this port, with this difference, that, according as you approach the line of the variable winds, these winds are not so regular as to the North of Arica.

The wind gets stronger as you get further off the land. It will then be perceived that the sea breezes last longer, and that the direction of the coast lying on the parallel of the station, loses its influence on the direction of the wind, which then has greater strength during the night than during the day. This distance is probably subject to variation, nearly in the same proportion as the band of variable winds which is along the coast; for this distance, which is greatest on the parallel of Arica, diminishes like the breadth of the band of variable winds according as you advance to the North or South of this port. It seems, nevertheless, that the chain of high mountains which exist throughout the whole length of Peru intercept the trade winds, and exercise their influence at a much greater distance from the land; for it is only at about 140 leagues off that the trade winds are met with, the direction of which is constant, and their strength uniform. The winds which blow within this limit, from South to E.S.E., are very variable in form and in direction.

Dampier, otherwise so exact an observer, in his treatise on the winds which prevail on the surface of the globe, in speaking of those which are felt on the coast of Peru, has neglected to distinguish between the narrow band where the land and sea breezes are weak and blow in a direction which depends on that of the coast, with the band much further off, where the winds are very variable from South or E.S.E., and acquire considerable strength. He seems to have confounded them when he says, "The S.S.W. and S.S.E. winds which blow on the coast of Peru are strong, and extend further out

than any of the very variable winds which are found under the shelter of the continent;" and he adds. "The general winds from E.S.E. do not blow but at from 140 to 150 leagues from land." If, instead of speaking in this passage of the S.S.W. to S.S.E. winds, we substitute winds from South to E.S.E., &c., all that is said will apply rigorously to the band of great breadth which is outside that where the land and sea breezes take place, and of which the outer limit is much nearer the coast.

However, it is not to be wondered at that this navigator, so remarkable for his sagacity and the correctness of his judgment, has omitted some details in his very short treatise, where he proposes to speak of the winds, breezes, tempests, tides, and currents, which are found in all the parts lying between the tropics.

The result of our own experience bears out the facts that we have stated respecting the light winds which occur near the land, and the different degrees of force which they successively have according as you get further off the land. During a navigation of ten months on these coasts, every time that the *Clorinde* sailed a short distance along the land, she never made more than 15 leagues in 24 hours, and sometimes she has even made less than 5. The greatest distance she ran, by keeping at 30 leagues off the land, was 50 leagues, with a very fine sea; some Peruvians, who were passengers with us, told us then that it was a storm for that country, so little were they accustomed to experience winds at all fresh.

It seems the light land breezes and those from the sea are not felt from Lima to Guayaquil, at a greater distance from the land than at Lima itself. The *Clorinde* did not navigate in these parts; but many captains of vessels, who have frequently made the voyage from one of these places to the other, told us that, from the coast to the distance of 10 or 12 leagues off, the winds were the same as about Lima; and beyond that they found fresh breezes, but variable, from South to S.E., which extended, as in all parts of the coast, to a great distance in the offing.

Other commanders who have frequented these seas, and inhabitants of the country, assured us, that in winter North and West winds are sometimes felt, but that they are generally light, and do not last long. It appears that these winds blow, in this season, to a considerable distance from land; for several vessels going from Valparaiso to Lima in winter have been baffled by short breezes from North to N.W., and by calms, although they were 80 leagues from the coast of Peru. Dampier states that these coasts are exempt from westerly winds; but our experience proved the contrary, and confirmed what was advanced by the inhabitants of the country. In July, 1822, being in lat. 17° S., at 30 leagues from land, we had light winds from North to W.N.W., which lasted two days; and when we were anchored at Callao, at the end of May, 1823, we had for three days following winds very brisk from W.N.W.

The winds from South to E.S.E. cause, in the offing, currents which run to

the N.W. Their greatest velocity was found to be 15 miles in 24 hours, and their least rate 9 or 10 miles. Between these currents and the land there is a counter-current, which bears to the S.E., and follows the direction of the land. Its breadth varies very much; sometimes its outer border approaches to 1 or 2 cables' lengths of the shore, at others it is some miles distant. The fresher the breeze, the more this counter-current increases in breadth and velocity.

In winter, when it blows from North to West, the currents bear to S.E.; but it is only near the land that they begin to be sensible.

Although the *Clorinde* almost always sailed before the wind in ranging along these coasts, the winds were so light, and calms so frequent, that it was often difficult to calculate the progress. It is presumable that the unavoidable errors which were then made in the reckoning have affected the estimated amount that has been made for the velocity of the current.

The following remarks on the winds to the North of Guayaquil are by Lieutenant-Commander James Wood, R.N., of H.M.S. *Pandora*, engaged on the survey of the Colombian coast. They will command implicit confidence.

The prevailing winds of the Pacific, with the exception of those on the coasts of Chili and Peru, have been little known. A few remarks, therefore, on those that obtain along the western coast of America from the River Guayaquil, as well as on the more regular and extended aerial currents which traverse the vast expanse of the open ocean, condensed from observations and information collected during a four years' cruise over the greater part of it, may not be destitute of interest and utility, especially as the northern portion is but little known.

The whole of this extensive line may be divided into three portions or zones:—

First, the *intertropical*, which is all more or less affected by the fine and rainy seasons.

Secondly, the dry and arid portion, which extends from 23° to 32° N., where the winds blow with almost the regularity of a trade wind.

Thirdly, the more variable northern coast, which is subject to greater vicissitudes of climate.

Guayaquil River to Guascames Point.

The Intertropical.—Along the whole of the coast from the River Guayaquil, in 3° S., to Guascames Point, in 2° N., the wind is mostly from South to West all the year round; the exceptions are few, and generally occur in the fine season. Both in beating up this coast to the southward, and in running down it, the former in the months of May and June, the latter in those of October,

November, and January, we had the wind from S.S.E. to West (by the South), with a constant current to the north-eastward, the only difference being that the winds were lighter, and the weather finer in May and June as we got to the southward; whilst the contrary took place in October and November; and in January the weather was generally fine, with moderate breezes.

Choco Bay.

After entering the Bay of Choco, of which Point Guascames forms the southern horn, the winds become variable; but during the time we were in the bay (from the end of January to the middle of March) it never blew very fresh, though the weather was often unsettled, and heavy rains frequent. The prevailing wind was from S.W., but north-westerly winds were not uncommon.

The following account by Dampier is perhaps as good as can be given:— "It is a very wet coast, and it rains abundantly here all the year long. There are but few fair days, for there is little difference in the seasons of the year between the wet and dry; only in that season which should be the dry time, the rains are less frequent and more moderate than in the wet season, for then it pours as out of a sieve." This kind of weather is found as far as Cape Corrientes, the prevailing wind being S.W., but N.E. winds were not uncommon. Off-shore in this zone, between the parallels of 2° and 5° N., the winds are equally baffling, especially during the months of March, April, and May. H.M.S. *Alarm*, in March, 1859, only made 30 miles in six days.

Chirambira Point to the Gulf of San Miguel.

When past Chirambira Point (the northern horn of Choco Bay) we had the wind more from the northward, and in the latter end of March had to beat up to Panama Bay against north-westerly and north-easterly breezes, blowing a fresh breeze at times, especially as we approached the bay.

In surveying this last-named part in January, 1848, we found the winds more variable, heavy rains almost always accompanying a change to S.W., from which quarter we once or twice had a stiff breeze.

Gulf of San Miguel to the Gulf of Dulce, including the Bay of Panama.

First or Intertropical Winds.—Between the southern point of the Gulf of San Miguel and the Gulf of Dulce, including Panama Bay and the coast of Veragua, the winds are regulated by the seasons. Towards the end of December the northers begin to blow. These are fine dry breezes, which

generally come on in the afternoon, and blow very fresh from N.N.E. to N.N.W. till near midnight, with a perfectly clear and cloudless sky, and the air so dry and rarefied that objects on a level with the horizon are distorted and flattened, and the same effects are caused as are seen during an easterly breeze off our own coast. Though generally a double-reefed topsail breeze, they occasionally blow much harder, especially off the coast of Veragua, where, in the months of January and February, even a close-reefed topsail breeze is not uncommon. During even the strongest of these, a dead calm often prevails 10 or 15 miles off the land, the only evidence of the gale that is blowing within a few hundred yards of you being the agitation of the water, which is raised into short hollow waves, which break on board and tumble you about awfully.

Towards the end of March up to the middle of April the southers begin to cease, and are succeeded by calms and light sea and land breezes, with occasional squalls from the south-westward. As April advances the squalls get stronger and more frequent, and by the early part of May the rainy season generally sets in, during the greater part of which South and south-westerly winds prevail; these are not very violent within the Bay of Panama; but from Punta Mala, westward, gales from the above quarters are frequent, and sometimes severe, bringing a heavy sea with them.

In the Gulf of Panama the winds are regulated by the seasons; the prevalent wind, however, is from the northward. In the fine season, commencing in December, these winds are regular and constant, bringing fine dry weather. To the southward of the gulf they blow much harder, and off the coast of Veragua a double-reefed topsail breeze in January and February is not uncommon. In April and May the northerly winds are less regular, and have more westing in them, with calms, light sea and land breezes, with occasional squalls from the south-westward. In June the rainy season sets in, and the southerly winds become stronger. Still the old N.W. wind is mostly found after noon, and vessels sailing from Panama at all seasons will generally have a fair wind until South of Cape Mala.

Between the Galapagos Islands and the coast, westward of the meridian of 80°, and southward of the parallel of 5° N., the winds are between South and West all the year round, and except between the months of February and June they are of sufficient strength and duration to make the navigation easy; but northward of lat. 5°, between 80° and 110° W., is a region of calm and doldrums, accompanied by rains and squalls of a most vexatious description. The weather met with can hardly be better illustrated than by the fact that in May, 1848, H.M.S. *Herald*, in her passage towards the Sandwich Islands, although towed for six days as far West as 89° 20′, still took forty days from Panama to 110° W., owing to keeping between the parallels of 8° and 10° N., and in March of the following year, in the meridian of 87°, and the lat. of 8° N., only made 30 miles in nine days.

The South-East Trade Wind.

In a former page some definition has been given as to the limits of the S.E. trade wind.

Off the American coast, from 450 to 600 miles distant, and between the parallels of 30° S. and 4° N., the wind is very steady, and gales or squalls are seldom experienced. The trade, varying between East and S.E., blows constantly in the middle of this zone. In the summer the direction varies from E.S.E. to S.S.E., and never to the North. When the sun is in the northern hemisphere the southern trades blow across directly from S.S.E., and on the contrary more East when it is South.

By examining the table on page 1074, it will be seen that the polar limits rarely reach the parallel of 30° S., and that the equatorial extent frequently rises into North latitude. From this it may be inferred that the S.E. trades are more certain and less variable than the N.E. In the region of the former, calms and storms are much less frequent than in the northern hemisphere, besides which the temperature is lower in the southern zone.

There are many singular anomalies, as before said, observed in its course over the islands, which cannot, perhaps, be well accounted for. At the Marquesas, lat. 10° S., it is tolerably regular. Among the islands of the Low Archipelago, especially from October or November to March, the easterly wind fails, and heavy squalls come from the opposite direction, and this more frequently by night than by day. The natives also say that the severe storms which they encounter come from the N.W. That the south-westerly gales of the higher latitudes approach the archipelago, is shown by the heavy sea which frequently sets in on the lee side against the regular wind, and thus making it more dangerous to land on those sides than on the others.

Captain Cook, when at Tahiti (as noticed on pages 630—631), found fresh gales from S.W. for two or three days at a time, and sometimes, though very seldom, from the N.W. When they were variable they were always accompanied by a swell from the S.W. or W.S.W., which also came in when it was calm. The conclusion he arrived at (most probably the just one as regards the Society Islands) was, that as the trade wind as found by him does not extend farther to the South than lat. 20°, and beyond that limit he generally found a westerly gale blowing, this westerly wind, when it becomes stronger, will drive back the weaker margin of the easterly wind, and thus encroach on its usual limits (see page 631). At the Samoan Group these variations assume the character of the cyclone or revolving storm, and commit great devastation. We shall speak of these presently.

That the parallel of 20° is *about* the southern limit, is apparent at the Tonga Group. Here the trade wind is by no means the constant wind, but westerly winds (or "foolish winds," as they are called by the natives) occasionally blow

in every season. They are peculiarly prevalent during February, March, and April, often blowing for several days together. The heavy swell from S.W. is also almost continual. This season of variable winds is characterised by the phenomena of hurricanes, as is the case with the Samoan Group (pp. 654—655), and Cook's Islands (page 526).

At the Fiji Group (page 680) the trade wind prevails from April till November. From November till April northerly winds are often experienced, and in the months of February and March heavy gales are frequent, assuming the usual character of the revolving storm.

When the sun is in South declination, the northern edge of the trades advances to the southward; thus they are interrupted at the Sandwich Islands during the months of January and February, and the S.W. winds usurp their place.

Within the tropics, wherever large groups of islands are found, the trades are subject to great variation, both in direction and force. Also to the northward of the tropic of Cancer, when bound from the Sandwich Islands for the American coast, there are many instances, during the spring and summer, of 45°, or even 50°, of North latitude, being reached before a westerly wind could be obtained.

The Western Part of the Pacific Ocean.

This portion of the ocean seems to have a different system of winds from those prevalent to the eastward, from the extension of the monsoons of the Indian and China Seas. The following passages, given by an anonymous correspondent to the Nautical Magazine for 1843, and repeated in the same work in 1859, seem worthy of great attention; they are therefore given as there found.

Mr. Horsburgh briefly states that the West monsoon, which blows regularly in the Indian Ocean, extends to New Guinea. This monsoon blows as steadily, strongly, and regularly, along the North side of New Guinea, at New Britain, New Ireland, and all contiguous islands South of the Equator so far eastward as Malayta, and the northern part of the New Hebrides, as in any part of the Indian Ocean whatever; and extending in a wind of gradually decreasing constancy and continuation, from hence far eastward to the Society Islands and Marquesas. The limits in latitude appear similar to the Indian Ocean, from 1° N. to 15° S.; occasionally to 19° S., and the period from the beginning of January until the end of March. Having said thus much, as this is written principally with the idea of endeavouring to show the practicability of making passages to the eastward in the Pacific (instead of the circuitous route round New Holland), which I have never heard has been attempted by trading vessels, although performed by whalers continually, I proceed to state a fact of such passages, and will first attempt to prove the practicability of making a passage

to the eastward during the easterly monsoon in South latitude, or from April until December or January, by keeping to the northward of the equatorial current, and between the trades or monsoons.

In October, 1835, being off Asia Islands, and wishing to make a passage to the eastward, a current, against which we could make no progress, stood to northward, and on the 19th of October were in lat. 2° 6′ N., long. 134° 11′ E. Having lost the westerly current, pushed to the eastward between the parallels of 2° 15′ and 2° 34′ N. On the 27th were in long. 147° E. From hence stood to the south-eastward, and made Matthias Island (it being my object to cruise in this neighbourhood); on the 20th, passed through St. George's Channel quickly, current favourable, and to the Treasury Islands. Cruised here until 19th of December; started with a westerly wind, which carried us to long. 169° 36′ E. on the 26th, having passed on the South side of Banks' Islands, becalmed two or three days, then with variable winds, chiefly from E.S.E., proceeded to the southward, and anchored in the Bay of Islands 15th January.

These passages were made at a season deemed impracticable, before the West monsoon had set in steadily, by a south-seaman of moderate sailing qualities, without using studding sails. The passage to the eastward may, I am convinced, be made at all seasons, by pursuing the same plan, which is, as before stated, to keep to the northward of the equatorial current, and between the trades or monsoons. Here you will have a variable wind chiefly from the westward, with a drain of favourable current at times. Further to corroborate this opinion, June 23rd, in lat. 1° S., long. 149° E., having been drifted from Matthias Island and New Hanover, by a westerly current of 2½ or 3 knots an hour, stood to the northward, got westerly winds on the Equator. With these made easting, and on the 27th reached lat. 0° 45′ S., long. 155° E.; made Bouka Point soon afterwards; then found a current equal in strength to that at Matthias Island. At this time the westerly current did not extend quite to the Equator.

Again, in September, 1840, being unable to hold on near the Admiralty Islands, in consequence of strong westerly currents, stood to the northward, and when in lat. 0° 24′ N., long. 146° E., proceeded to 2° N. before losing the current; then worked to the eastward, and stood to the southward on the East side of the Green Islands, which are in about long. 156° E. The passage from Morty to Bouka has also been made in August by adopting the same plan. Although all these passages terminated in the longitude of the Solomon Islands, it was not through inability to proceed farther to the eastward, but merely in consequence of this being the destination. More might be quoted to show that these line currents seldom extend northward of 2° N.

During the West monsoon in South latitude, it has been a common practice, for the last fifteen years, for ships to make passages from Timor to the Solomon Islands, some returning at the commencement of the easterly monsoon, and others spreading over the Pacific. Last year (1842), five ships which had been

cruising in the Indian Ocean proceeded eastward between January and April, one along the line to the eastward of the Kingsmill Group, another to the Solomon Islands and New Zealand, and the remainder to New Ireland and elsewhere. From all which, I wish it to be inferred, that any ship leaving Manila between the beginning of December and the commencement of March, or any port from which she can reach the North end of the Molucca or Gillolo Passages, or Dampier's Strait, between the middle of December and the middle of March, will make a speedy passage to any part of the Pacific Ocean in East longitude; and that during all other seasons the passage is practicable by keeping northward of the equatorial current, and between the monsoon winds.

In the period of the West monsoon, northerly and N.W. winds prevail to the Cape of Good Hope of New Guinea. Passing eastward of this point the westerly wind will generally be experienced fresh and steady, with a current of 2 or 2½ knots, running to the eastward, and extending from the New Guinea shore to about 1° N. A ship may pass near the St. David's Islands without risk of losing this wind or current, and northward of Providence Islands. From hence any of the passages may be chosen according to discretion. If St. George's Channel be adopted, it may be preferable to steer along the line until in the longitude of the Admiralty Islands, then pass to the south-eastward between these and Matthias Island, thus avoiding the low islands and reefs to the southward; sail should be carried during the night without fear. Keeping along the Equator there cannot be many undiscovered dangers, this track having been a good deal frequented of late years. The other route to the northward of the Solomon Islands when bound to New Zealand, the Fiji Islands, or anywhere to the eastward, appears to be the best. In the case of New Zealand, the tenth degree of South latitude should not be crossed until reaching long. 171° or 172° E., then steer to the southward on the West side of the Fiji Islands, passing pretty near, as the easterly winds prevail far to the southward in January, February, and March; but by weathering the reefs near the South end of New Caledonia, a passage may always be effected.

The westerly monsoon in the Pacific, as in the Indian Ocean, is attended with cloudy, overcast weather, squalls, and heavy rains. Some of these squalls are very severe, requiring all sail to be taken in when crossing the wind; even when running, close reefs will be found enough. I have experienced several near New Ireland and New Guinea, which generally gave warning, and commenced at W.S.W., blowing furiously the first hour, and continuing in a strong gale, veering to the N.W. for five or six hours.

From lat. 10° S. to the southern tropic, hurricanes are likely to be experienced from November until April, agreeing also in this respect with the Indian Ocean; and I make no doubt that one of these occasioned the loss of La Pérouse and his fellow voyagers. These scourges of the sea are more prevalent near the New Hebrides and New Caledonia than the Fiji Group and Friendly Islands. In fact, the liability to hurricanes appears in exact ratio to that of the S.W.

monsoon, or rather to the meridians in which the westerly monsoon blows, differing in latitude; the monsoon seldom extending beyond lat. 17° or 18° S.; indeed at times 13° S. is the limit, whereas hurricanes are experienced as far as the tropic. From all I can gather of these hurricanes of the South Pacific, having conversed with several masters who have encountered them, some of whom have had their ships dismasted, I scarcely think they are of that terrific description occasionally experienced elsewhere; and am almost inclined to believe them more often and more severely felt near the islands, than well clear of the land, although aware of this disagreeing with the new theory; but future facts will be necessary to elucidate this subject.

They are still of unfrequent occurrence in the Pacific, several years intervening without any ship encountering one. I possess no facts which would be serviceable in pointing out their track or direction of rotation. They will, without doubt, be considered to agree with other places in the same latitude, yet a few more well authenticated descriptions of these southern hurricanes would not appear to encumber the evidence of their uniformity in these particulars.

Near the Friendly Islands (and perhaps elsewhere) storms occasionally happen of extreme violence, blowing from one point, and producing similar effects to hurricanes. In November, 1835, eight or ten ships, English and American, encountered one of these near Tonga-tabu and Eoa, from S.S.E., the heavy part of which lasted about eight hours, causing more or less damage to all; one or two were dismasted. It was described by the masters whom I saw, which included most of them, as being more severe than anything they had ever seen. Ashore at Eoa it was most violent—houses and trees blown down, and all the crops destroyed. It likewise did great damage at Tonga-tabu, and was also felt very severely at the Hapai Islands and Vavao. Here Mr. Thomas, the missionary, was obliged to shore his house up, although it was considered by the natives that a gradual decrease in strength had been experienced in proceeding northward. Still farther North the *Nassau* encountered it in lat. 16° N., in the shape of a heavy gale. At all these places the wind was from the southward; S.S.E. by the ships; ashore they had no compasses, but it certainly was from the southward, and without shifting. I have thus endeavoured to be explicit, through an impression that more is required to be known of hurricanes and gales in localities; and having a strong belief that many of the hurricanes, even those producing the most disastrous effects, will be found very local.

Reverting again to the N.W. monsoon—at the Solomon Archipelago it commences in December or January. In some years these months are tolerably fine. During February and March strong winds with severe squalls and heavy rains may be expected. April generally is a fine month, with variable winds; also in May there is a good deal of fine weather. The S.E. monsoon sets in strongly in June, with heavy rains and squalls, and continues so until

the end of August; in all these months, nevertheless, there are considerable intervals of fine weather. In September the strength of the monsoon is spent, and the weather is more moderate from this time until the return of the north-wester.

Farther to the eastward, about the meridian of Rotumah, the westerly monsoon is less constant, beginning generally in January, and blowing strongly about seventeen or eighteen days consecutively, then declining; and the easterly wind returning in a fresh breeze for nearly the same period; the westerly wind again intervenes, usually commencing with a gale, and always continuing in a strong breeze, with squalls and rain; the easterly and westerly winds thus alternating until the end of March, when the S.E. trade sets in steadily, Proceeding still farther to the eastward, the westerly monsoon gradually becomes less constant, and finally disappears somewhere about the meridian of the Marquesas Islands.

On November 13th, 1879, the barque *Courier*, Capt. B. Moore, left Astrolabe Bay, on the North coast of New Guinea, experiencing calms and light winds, with a westerly wind of from 16 to 20 miles a day. "From Cape King William we had nothing but very light airs and calms, with heavy rain, until November 30th, when we sighted the Eddystone. We then had been daily expecting the westerly monsoon, and it was my intention to have run through the Solomons between Ysabel and Malayta, keeping to the eastward until I was able to weather the reefs on the South end of New Caledonia, as recommended in Findlay's South Pacific Directory, at that time of year. But after drifting in sight of Eddystone Island until the evening of the 6th of December, we picked up the S.E. trade, and I being well to windward and able to weather the Louisades, stood right down to the Australian coast, and on the 10th observed, in lat, 17° 54′ S., long. 152° 54′ E., where we lost the trade; from thence had calms and light winds. At midnight of the 17th, I passed between Kenn and Frederic Reefs with an E.S.E. breeze, and on the 19th, at noon, was abreast of Sandy Cape. I cannot but think it was very strange that we should feel nothing at all of the westerly monsoon at that time of year, especially as it is said to blow steadily at the Solomons all through November."

New Guinea.—Capt. Moresby, speaking of the winds of Eastern New Guinea, says:—The meteorology of Eastern New Guinea appears to be different from that previously supposed. The N.W. monsoon blows from November till March, accompanied by occasional westerly gales, with fine weather intervals. The S.E. monsoon, which follows, we never found to blow continuously up to the time of our leaving the coast in May, for we experienced light variable winds and calms; whilst on the northern shores of Eastern New Guinea the S.E. monsoon appears to be altogether arrested by the lofty Owen Stanley Range, the summits of which, during the month of May, were observed with heavy clouds, leading us to believe that the monsoon was blowing strongly on

the southern shores of the peninsula, whilst we on its northern side were sailing in calm and waveless waters.

The barometer showed little or no fluctuation, remaining steady between 29·80 and 29·90; the thermometer in the shade varying from 83° to 86°. The tides varied in rise and fall from 8 to 12 feet.

In February and March, 1873, calms and variable winds were experienced, with fine clear weather. Occasionally a fresh breeze from the S.E. prevailed for two or three days, succeeded by calms and light winds. Excepting two or three days the weather was always dry.

In the same months of 1874 more wind and rain were experienced, the westerly monsoon with unsettled weather being felt from the middle of February to the 11th of March. After which, easterly breezes with sometimes calm and clear weather were felt; then after a few days of unsettled rainy weather, with strong E.S.E. breezes, it again became fine, with light and variable winds, generally from the northward, until the 29th April, when the *Basilisk* left the vicinity of East Cape for the westward.

New Zealand.

The great extent of New Zealand in latitude will lead to the inference that a considerable variation will exist in the winds prevalent in different portions of it. But as it lies outside the verge of those regular winds which characterize the tropical regions, such uncertainty must be expected as is found in similar latitudes, but the predominant direction will be from the northward of East or West. Such, in fact, is found to be the case, from a register kept at Wellington, from October, 1840, to September, 1842; by which it appears that the northerly winds predominate over the southerly in the ratio of 432 to 226, but this ratio is unequally distributed over the different seasons. Thus from October to December, the number of days on which the North winds prevailed was 170; South, 72; westerly winds, 8; and variable, 13. From January to March, northerly, 89; southerly, 86; being nearly equal; West, 2; variable, 6. From April to June, North, 96; South, 50; West, 8; variable, 22; and from July to September, North, 95; South, 75; West, 4; variable, 7.

It is observed that the North and N.E. coasts of North Island are most exempt from heavy gales, that the eastern and southern coasts are subject to S.E. gales, to which, from the scarcity of harbours, ships are much exposed; that Cook and Foveaux Straits are visited by frequent and sometimes furious gales from N.W. and S.E., while the prevailing winds on the entire western coasts are from N.W. to S.W.

Going from East Cape to Cook Strait a very marked phenomenon frequently takes place on rounding East Cape. The strong westerly wind that drives

across the bay carries its line a few miles eastward of the cape, but southward of this the breeze is N.E. Sometimes a vessel may be becalmed for hours between two strong breezes from West and N.E.

In Cook Strait the prevailing, indeed the almost constant winds are N.W. or S.E.; and approaching either entrance with N.E. and S.W. winds, the former will almost certainly change to S.E., and the latter to N.W.; the changes are common, and frequently very sudden; lightning or a dark bank of clouds rising are pretty certain indications that the wind will come from the quarter in which they appear, but it is not an uncommon circumstance for a vessel running through the strait with a fair wind on opening out either entrance to be taken aback with one from the opposite quarter, with little or no warning. Gales from these quarters are also frequent, and blow with great violence; those from S.E. are most frequent during the winter months of May, June, and July; a falling barometer is a certain indication. They come on very suddenly, last often three days, and are generally accompanied by rain and thick weather. N.W. gales are most common in spring and summer; they are exceedingly violent, though generally of short duration, and at their strongest raise a high barometer. A remarkable transparency of the atmosphere is a sign of a N.W. gale, which comes on at once to blow furiously.

The finest months are April, August, November, and December. Thunder and lightning are unusual.

At *Otago* North winds are rare; the ordinary sea breeze is N.E.; it seldom blows from the East; S.E. winds are accompanied by thick, hazy weather, but seldom blow home. South winds do not blow strongly, unless they veer to S.S.W. and S.W.

The winds off the land are the strongest, and W.N.W. winds blow the hardest, the latter being at times a hot wind. The squalls from this quarter are heavy. The heaviest gales are in November, often with large hailstones.

The dirtiest weather is in June and July. January is the hottest, and July the coldest month. Snow falls and lies on the ground for two or three days in June, July, and August. South to S.E. is the rainy quarter.

Foveaux Strait and the coasts of Stewart Island are, without doubt, the most boisterous localities in New Zealand; heavy gales from N.W. to S.W. are the prevailing winds, and seem to blow, without regard to seasons, at all times of the year, occasionally continuing for weeks without intermission. N.W. winds are the most frequent in Foveaux Strait, which seldom last less than four or five days, and often bring rain and thick dirty weather; thunder, which is not of common occurrence in New Zealand, is said to indicate that the gale will be of unusually long duration; the barometer falls on the approach of this wind, though it often continues to blow hard after the mercury has risen; on these occasions, however, it generally veers to S.W., and the weather clears. With a strong N.W. or westerly wind in Foveaux Strait, it is often from S.W. on the eastern coast of Stewart Island, and on the western

coast of that island the N.W. wind becomes N.N.W. The worst weather in Foveaux Strait is said to occur in July.

In the immediate vicinity of the land, more especially in the central portions of the islands, the wind will be found to be deflected by its influence, and this variation necessarily depends on the configuration of the coast, so that no general notion can be given of it without entering into much greater detail than we have space for.

Australia.

The East coast of Australia, with respect to winds and currents, requires a division, the part to the southward of the tropic of Capricorn being placed under different, and almost opposite circumstances, to that within, or close to it.

The S.E. trade cannot be said to blow home upon the East coast of Australia between Sydney and Sandy Cape, except during the summer months, when winds from that quarter prevail, and often blow very hard; they are then accompanied by heavy rains and very thick weather; generally, however, from October till April, they assume the character of a sea breeze, and except their suspension by south-easterly or westerly gales, are very regular.

In the month of December hot winds from N.W. will sometimes last for two or three days, and are almost always suddenly terminated by a gust of wind from the southward; south-easterly gales also are not uncommon during this month; and in February and March they are very frequent.

In winter, from May to September, there are frequent westerly winds, with fine weather. The gales at this season blow from seaward, between N.E. and South, and bring rain; nor is there any settled weather in winter with sea winds, and even when between North and N.W. there is often rain, though the wind is usually light in those quarters.

The most prevailing winds at all seasons of the year are from the southward, and probably oftener from the eastward of that point than from the westward.

Whilst the wind blows from various quarters on the southern parts of the East coast, the S.E. trade prevails with more regularity within, and close to the tropic, and generally blows home to the coast, from April to September, producing in some places land and sea breezes near the shore, with fine weather, which lasts longest as Cape York is approached. Although the S.E. trade may generally be considered steady, between the tropic and Torres Strait, from April to September, H.M.S. *Bramble* experienced violent gales in the months of March and May, in the vicinity of the tropic.

During the N.W. monsoon, from November to March, the winds on the East coast to the northward of Sandy Cape are variable, but generally from the northward and westward, with occasional calms, rain, and clear weather; but during this season violent gales frequently blow, accompanied by rain, thunder and lightning.

From the early part of October to April, the coast in the vicinity of Port Jackson is subject to tolerably regular sea and land breezes, the former blowing from N.E., and the latter from the westward. The sea breeze generally begins at 10 a.m., and subsides after sunset; the land wind commences at about midnight, and continues until 8 a.m. The exceptions to this rule are North and South winds, which occasionally prevail, as do also the N.W. hot winds; these latter, after blowing for a period varying in duration from 12 to 72 hours, are usually succeeded by sudden violent gusts from S.S.E. to S.S.W., which generally settle into a gale from those quarters, accompanied with rain. The greatest vigilance exercised by masters of vessels possessing local experience, is frequently insufficient to prepare for the suddenness with which these gusts overtake them; strangers, especially, should therefore be particularly careful to be ready for the change during the time when the hot wind is blowing, or the brief calm which sometimes intervenes.

From April to October, after the gales which usually succeed the autumnal equinox are over, and before those which generally precede the spring equinox commence, the wind prevails strong to the westward, between N.W. and S.W., with fine clear weather, and occasional gales from the North or South, with rain.

Except during the equinoctial gales, the wind very rarely blows on shore with sufficient violence to endanger the safety of a well appointed vessel; but in the spring equinox, when these gales set in from S.E. to East, accompanied with dense rain and a high barometer, they blow with great fury from 24 to 48 hours, and finish with a long slowly declining gale from South to S.W.*

Easterly gales, which appear to be regular in the number as well as the periods of their visits during the year, are the winds of all others most dreaded in the province, both on shore and afloat.

June, July, and sometimes August, are the months in which the province

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* Storm Signals on the Coast of New South Wales.—The existence of gales which are likely to endanger shipping, will be signalled at the principal telegraph stations on the coast of New South Wales in the following manner, viz.:—

The signal masts will support two yards, which are to cross each other at right angles, in the direction of the cardinal points of the compass, the yard-arms denoting, respectively, North, East, South, and West; midway between North and East will indicate N.E., &c.

A violent squall will be represented by a conspicuous diamond-shaped signal.

A heavy sea will be represented by a drum-shaped signal.

Gale, with clear weather, will be represented by a diamond-shaped signal over a drum.

Gale, with thick weather and rain, will be represented by a diamond-shaped figure with a drum over it.

The direction from which a *gale is blowing* will be indicated by the particular yard-arm between which and the mast-head the geometrical signal is suspended.

Place where gale or squall is blowing will be shown by hoisting the numerical flags already in use at Sydney, Newcastle, and other coast stations.

Gales that are general over a large portion of the coast will be indicated by the geometrical figures, without the mast-head flags.

of New South Wales is visited by them in their full violence. During these months, when the weather is unsettled, with the wind unsteady, cloudy weather and occasional rain, an easterly gale, lasting two or three days, may be looked for. They generally come with light winds from the northward, accompanied with rain sometimes lasting twenty-four hours, and an overcast, murky sky; veering round to the N.E., they freshen gradually into a gale. The barometer is not in any way affected by their approach or continuance, standing steadily at from 30·12 to 30·18 throughout their duration. A large number of coasting vessels are missed after one of these gales. In July, 1866, fourteen coasting vessels were driven on shore on various parts of the coast or foundered at sea; and in June, 1867, during a similar gale from the eastward, eight or nine more followed.

On the South Coast of Australia similar weather may be looked for between Cape Howe and Wilson Promontory as prevails on the Eastern coast, and the same dangerous easterly gales may be looked for. The prevailing wind, however, on this coast is from the northward, both in summer and winter. This wind generally commences early in the day, and after lasting two or three days suddenly terminates with a thunder storm from West or S.W., indicated by the fall of the barometer, which remains low until the storm is quite over, although there may be intervals of fine weather for two or three days. In the spring and autumn S.W. or sea breezes are felt. Of the easterly gales, Wilson Promontory appears to be the boundary, as they very seldom occur on the coast to the westward.

Westward of Cape Howe south-westerly breezes generally prevail during October, November, and December; and in January, February, and March, from the opposite direction. In the vicinity of Bass Strait N.E. winds blow during the hot summer months, lasting four or five days, and changing suddenly to the S.W. They are generally accompanied by a thick mist, but in the winter a clearer sky accompanies them. Westerly winds prevail for nine months of the year.

On the coast of South Australia, from June until the end of November, the prevailing winds are from the westward; they usually commence at N.E. or North with a falling barometer, veer to the N.W. and blow hard, sometimes veering about between N.W. and S.W. for two days, with much rain; with a rising barometer the wind changes to S.W. and South, and blows strong.

From December until the beginning of June it is what may be called the fine weather season on this coast. The prevailing wind is from the S.E., and of moderate force; it veers to the eastward during the night, and to the southward in the day, being strongest in the afternoon. A high barometer indicates a long continuance of south-easterly winds. Westerly gales sometimes occur during the fine weather season.

HURRICANES.

This very important subject, as at present understood, is a comparatively new one in navigation. But it has been so much and so ably discussed, that its nature is now well understood, and by the application of the results of these investigations, much of the danger formerly attendant on navigation in certain regions will be avoided in future.

In the Pacific, like many other of the phenomena there met with, the recorded observations on hurricanes or typhoons are too scanty to have drawn up any regular system for them; so that for the present it remains for the navigator to apply "the law of storms" as developed in the Atlantic and Indian Oceans, to these same meteors in the Pacific, and almost without question they will be found accordant, in most instances, with that law.

In the Southern Pacific Ocean we have a groundwork to assert the character and occurrence of the true cyclones; and as Mr. Piddington states almost all that need be said on the subject, we quote his words:—

In the tropical regions of the South Pacific, from the barrier reefs of Australia through the numerous groups of islands to the Low Archipelago, and perhaps even to near the coast of South America, and from the equator to lat. 25° S., there is no doubt that true hurricane storms (cyclones) occur of as great violence at least as those in the North Pacific; but from the scattered accounts of single ships, as also of missionary residents on the various islands, we cannot say anything positive as to their tracks, though they appear to come from the eastward amongst the islands, and sometimes to curve to the southward. The following are a few notes. The seasons at which they prevail seem also to be the same as those of the Mauritius and Bourbon.

At Viti-Levu, in the Fiji Group, in February, 1841; a well-defined circular storm (cyclone), tolerably observed, seems to have moved to the southward, and, though it lasted four days, was not felt at Tonga, 8° or 10° to the S.E. of it.

At Apia Harbour, in the Samoan Group (Navigators Islands), lat. 14° S., on the 16th of December, 1840, a true hurricane storm (cyclone), of great violence, with a fall of 4 inches of the mercury (by a damaged barometer), was observed, moving from the North to the southward; and four years previous, another, also well defined, moving from the N.E. to the south-eastward, the change of wind being from S.E. to N.W. The space between the Samoan Islands and Friendly Islands is said expressly to be subject to violent *hurricanes*, and that scarcely a year passes without some of the Friendly Islands suffering from them. Their violence is such that many of the American whalers have been made complete wrecks of by them; two were lost about 1842 (year uncertain) at the Navigators Islands.

At the Kingsmill Group, *on the equator!* violent storms, which appear to be typhoon-like, are experienced.

At Vavau, in the Friendly Islands, lat. 19° S., long. 173° W., in 1837, the

American whaler *Independence* was driven on shore by "a hurricane," and taken off by a shift of wind.

The account of the storm at Rarotonga, in the Hervey Islands, in lat. 19° S., long. 160° W., described by Mr. Williams, and quoted by Col. Reid, gives us unfortunately nothing further than the certainty that hurricanes (cyclones) prevail there at times.

Mr. Thom says:—"In December, 1842, H.M.S. *Favourite*, on her way from Tahiti to the Island of Mangeea, met with a storm of a rotary kind, and so severe, that the vessel was hove-to under a maintopsail. Capt. Williams was warned of a hurricane before his departure, which shows that storms of this kind are familiar to the natives."

At New Zealand there is no doubt that true rotary hurricanes (cyclones) sometimes occur, and these of considerable violence. In the U.S. Exploring Expedition, vol. ii., p. 381, is a very good account of one which occurred February, 29, 1840, at the Bay of Islands, said to have been the severest which the missionaries had experienced there. It was felt at other stations, with all the veerings, calm centre, &c., of a true tropical hurricane (cyclone), its course being to the south-westward.*

On July 28, 1840, H.M.S. *Buffalo* was wrecked in a heavy gale, which lasted three days, at Mercury Bay, New Zealand. About that time also three American whalers were wrecked at Port Leschenhault, in one of the strongest hurricanes ever experienced by their commanders.

In the great space lying between Van Diemen's Land and Cape Horn, we have scarcely any observations of rotary storms, but in a capitally well-kept log of the ship *Lord Lyndoch*, Capt. Clapperton, afterwards master-attendant at Calcutta, we find that in the month of December, 1820, in lat. 45° S., long. 117° W., a "gale was experienced which veered from N.W. to S.W. in fourteen hours, or about half a point an hour, in which time the ship, standing to the N. 60° E., made 83 miles on that course." If this was a rotary storm (and the barometer fell from 29·70 to 29·07), it passed here to the southward, on a track a little to the northward of West, and travelled at the rate of about 15 miles an hour. Judging from the fall and subsequent rise of the barometer, as well as the veering of the wind, there seems no reason to question that it was so.

In a newspaper article, copied from the *Sydney Herald*, are the following (imperfect) extracts and notes:—"So completely does the law of rotation appear to be from left to right, in gales of wind off the coast of Australia, and on the neighbouring ocean, that it is scarcely possible to escape the obser-

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* It is said to have passed between the Bay of Islands and the River Thames, at the rate of about 340 miles in thirty-six hours, or say, 10 miles an hour. Commodore Wilkes suggests that this may have been the same as that which occurred at the Fiji Group, which is very probable.

vation, in perusing the log-books of any extended cruise. One further example to show this shall now be quoted.

"The whaler *Merope* left Sydney, March 22, 1840, with the wind at South, steering for Lord Howe's Island. On the 24th she was in lat. 34° 4′ S., long. 158° 35′ E. The order of the wind's changes was as follows:—23rd, at S.E., veering N.E.; 24th, N.N.E. and N.E.; 25th, increasing from N.E., N.N.E., E.N.E., with a tempest; 26th, N.E. to North, with a confused sea, N.W., and drawing to West; 27th, S.W., South, S.S.E., and back to South. The wind thus completed a revolution in five days, on a direct course from left to right.

"Between Australia and America a similar course is pursued by the winds to that which is followed between the Cape of Good Hope and Cape Leeuwin, and more than one instance has come before us of vessels having been driven *all round the compass* during a gale, not far from Cape Horn."

The following examples from Capt. Stokes' journal (Voyage of the *Beagle*, vol. iii.) show the general character of the gales on the West coast of South America. About the lat. of 50° S., April 5, 1828, a gale came on from North off Cape Tres Puntas, blowing on the 6th, 7th, and 8th, from North, N.W., and S.W., with squalls, thick weather, and rain. It abated on the 9th, veered to the southward, and then to S.E., when it ceased. This was from *left to right.*

On the 10th of April another gale came on from N.W., which as suddenly subsided in the western quarter. This, says Capt. Stokes "was singular, for those we have experienced *generally* commenced at North, thence drew round to westward, from which point to S.W. they blew with the greatest fury, and hauling to the southward, usually abated to the eastward of South." These gales, therefore, rotate from *left to right.*

It would seem that as to violence, at least, hurricanes are felt as far South as Patagonia, where ("Nautical Magazine," May, 1846) "a severe S.S.E. hurricane is said to have swept the coast from the Bay of Camaros to the Island of Desejada, occasioning the loss of twelve English and American vessels." We do not know if it was rotary, or what was its track.

In the voyage of Don Juan de Ulloa, in 1743, speaking of the weather on the coast of South America, we find some account of storms which resemble rotary ones. In fact, he describes one which he encountered, in April, 1743, in lat. 40° S., which lasted in its full violence from March 29th, till April 4th. It began at North, and twice shifted to South, returning in a few hours to North.

Tempestuous weather is equally common in the latitudes of 20° and 23° in the South Sea, as in the oceans of Europe. Along the coasts and adjacent seas the winter begins in the month of June, and lasts till October or November, its greatest violence being past in August or September. Storms, which arise with great rapidity, are very frequent during the whole winter; northerly winds are very prevalent, and often of extreme violence, raising a

tremendous sea. It often happens that these violent North winds, without the least sign of an approaching change, shift round instantly to the West, which change is called the *Travesca*, but continue to blow with the same force. Judging from this and the rest of the paragraphs, Mr. Piddington says it may be concluded that the storm tracks between 40° and 20° S., between the meridian of Juan Fernandez and the coast of South America, appear to be from westward (and probably from *north*-westward), toward the coasts.

From 20° S. to the Equator, and thence to the Gulf of California, our information is still very deficient. Mr. Redfield and Colonel Reid incline to think that the storms on the coasts of Nicaragua, Guatemala, and Mexico, are connected with those of the Gulf of Mexico, or perhaps originate there.

With this we will close this important subject. At some future period the navigator may be presented with something more determinate on the character of the Pacific hurricanes. The present notices will serve to draw his attention to these phenomena.

ON THE USE OF THE BAROMETER.

The following observations are extracted from those made by M. F. Labrosse, as translated by the United States Hydrographic Office :—

It is indispensable to know, in order to make use of the barometer, the *mean barometrical* height, or *mean level* of the mercury, at the position of the observer.

Thus the mean barometric height in the part of the Pacific where the trades continually blow, varies ordinarily from 29·84 inches to 29·96 inches. But it is worthy of remark that, especially in the western part of the inter-tropical region, the barometer rarely remains steady within the above limits.

Experience shows that decided falls precede or accompany the westerly winds, which sometimes take the place of the trades, during the summer months of each hemisphere. Barometric heights are often observed between 29·29 inches and 30·08 inches in both the N.E. and S.E. trade regions; but bad weather is only to be feared when the fall is rapid.

In the southern hemisphere we obtain 30·00 inches at 30° S.; 29·88 inches at 35° S.; 29·73 inches at 40° S.; 29·65 inches at 45° S.; 29·57 inches at 50° S.; 29·53 inches at 55° S.; and 29·45 inches at 57° S. The mean barometric height at Cape Horn is 29·25 inches.*

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* In the Antarctic voyage of the *Erebus* and *Terror*, 157 days' observations were made between 60° and 67° S., and the mean pressure of the barometer found to be 29·122 inches; between 65° and 71° S., 71 days' observations gave 29·030 inches; between 70° and 75°,

In the region of general westerly winds the barometer ordinarily announces several hours in advance any important changes in the force or direction of the wind. Gales may nearly always be foretold twelve hours in advance.

The barometer is *high*, or *rises*, when the wind is from the adjacent pole; and *low*, or *falls*, when it blows from the Equator. When the barometric level remains stationary for five or six hours, changes in either the force or direction of the wind need not be apprehended.

It will blow a gale whenever the barometer rises or falls very suddenly, especially when the level reached is distant from the mean level.

It is best, then, in observing the barometer, to note not only if it is above or below the mean level, but particularly to observe its rise or fall since evening, since morning, or during the three or four hours previous. Thus a moderate movement (say of ·04 to ·08 of an inch in four hours) indicates moderate winds; while a sudden rise or fall (say of ·16 to ·20 of an inch in five hours, or ·5 to ·8 of an inch in twenty-four hours) foretells a gale.

If the wind is from the direction of the elevated pole, and the barometer stands very high (at ·6 to ·8 of an inch, or more above the mean level), a sudden fall, accompanied by a rise in the thermometer, shows that the wind will soon come out strong from the direction of the Equator.

If, on the contrary, the wind is from the direction of the Equator, and the barometer stands very low (at ·6 to ·8 of an inch below the mean level), a sudden rise foretells a shift of wind toward the adjacent pole.

Cold weather and a sudden fall in the barometer below the mean level indicates snow.

Finally, according as the rise or fall of the barometer is more or less rapid, the weather predicted is more or less close at hand, and will last a longer or shorter time.

Observations on the use of the barometer in the southern hemisphere, by M Le Commandant Prouhet:—

"It may be observed, as applicable to the whole zone, that the direction of the wind has more influence on the barometrical height than even the state of the weather. This influence is much stronger in the variable winds of the southern hemisphere than in those of the northern. It may be also observed that all meteorological phenomena are characterized more strongly in the southern hemisphere. On the parallels of 42° and 43° the barometer, which marked 29·88 inches, with squalls from S.E., stood steady at 29·53 inches, with a gentle breeze from N.E., varying to North; and at 29·21 inches, with winds from West and fine weather. Several hundredths of an inch fall in the baro-

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38 days' observations gave 28·898 inches; and between 75° and 78° S., 34 days' observations gave 28·970 inches; thus proving the lowest pressure to exist between 70° and 75° S.—*Contributions to our knowledge of the Meteorology of the Antarctic Regions, published by the Meteorological Office*, 1873.

meter, when the wind is from S.E., may indicate worse weather than a fall of twice the amount when the wind is from N.E., or of three times the amount when it is from N.W. This influence that the direction of the wind has over the barometer becomes more and more marked as the latitude increases. So that the standard established for our climates, and which is accurate enough as far South as 44° or 45° S., becomes altogether inexact in higher latitudes.

"It would appear to be almost necessary in these latitudes to graduate a scale for each of the four principal directions of the wind, viz., S.E., N.E., N.W., and S.W.; thus a level at 29·90 inches, with winds from S.E., can be considered as very low, and in no sense gives the idea of variable weather, while 29·10 inches, with winds from N.W., is a mean level, which answers very well to this kind of weather.

On the parallels of 56° and 57° S., a slow and uniform fall to 28·35 inches, with winds from N.W. or West, causes less anxiety than a level of 29·50 inches on the West coast of France. If sudden oscillations occur, however, there is grave cause for alarm. Everywhere, I think, but principally in these latitudes, movements of this nature foretell bad weather, which is never caused by a slow and regular change. A change of ·02 of an inch per hour might here take place without exciting apprehension; a greater rapidity of movement is invariably succeeded by squalls, and if it attains a rate of ·04 of an inch per hour, gusts of great violence are to be expected. There is, therefore, considerable difference in the laws of the barometer according to the latitude; half the above movement, in the neighbourhood of 40°, indicated the approach of furious squalls.

"The line of demarcation which it is the practice to draw near the parallel of 44° or 45° S., to denote the limit at which our barometers cease to be exact, would appear to be arbitrarily placed. In the South Atlantic, where the first observations on this subject were undoubtedly made, it appears to be quite accurate; but in the middle of the South Pacific, the change in the laws regulating the barometer is not appreciable until we reach 48° or 49° S.

"In the southern part of the zone of variable winds the laws governing the movement of the barometer are the same as in the case last mentioned, depending upon the direction of the wind; a rise indicating pleasant weather without a change of wind, or that the wind trends toward S.E.; a fall indicating that the wind trends toward N.W., or, if it does not change, that the weather will grow worse; but the extent of rise or fall is not at all the same as it is in the other part of the zone, and we would be very apt to be misled if we relied upon a knowledge of the working of the barometer obtained in other localities."*

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* A useful work has been issued by the authority of the Meteorological Council, entitled "A Barometer Manual for the use of Seamen," 1884.

CHAPTER XXII.

THE CURRENTS OF THE SOUTH PACIFIC OCEAN.

Next to a knowledge of the prevailing winds, that of the currents is the most important to the navigator. By the combined action of these two phenomena, and their effects are frequently coincident, a passage may be made in a much shorter period, though apparently by a circuitous route; and it will be the object of the following remarks to point out what is known, and what may be anticipated to be found in the various portions of the Pacific.

Like many other branches of physics, the origin and exciting cause of currents is still involved in some obscurity, though all analogy points to the same source as that to which the regularity of the system of winds is owing—the revolution of the earth, and the consequent unequal distribution of heat. The action of the wind itself certainly has no small share in effecting the circulation, if it be not the sole exciting cause, as there is some reason to suppose. The effect of tides is also supposed to be another element in their action, but as yet so little is absolutely known of the propagation or progress of the tidal wave, that no deductions can be confidently made from them.

Currents have been distinguished as of two classes—the *drift current* and the *stream current.*

The drift or drift current is the mere effect of a *constant* or *very prevalent* wind on the surface water, impelling it to leeward until it meets with some obstacle which stops it, and occasions an accumulation, and consequently *stream* of current.

The stream current is thus formed by the accumulated waters of a drift current. It is more limited, but it may be of any bulk, depth, or velocity.—*Purdy.*

That ocean waves have a progressive motion is evidenced by their forming the drift current, though it is denied by many that a wave has anything more than an undulatory movement.

There is much greater uncertainty in ascertaining the rate of currents by the means ordinarily employed than is usually considered. It is pretty certain that much error of dead reckoning, now attributed to the effect of current, would be properly placed to other accounts. Without very great care in the navi-

gating a ship, an exact estimate of their rate and direction cannot be made. Bad steerage, the heave of the sea, imperfection in the log or glass, uncertainty of the leeway, all tend to invalidate the estimate formed without certainty as to the extent of the allowances that must be made on these accounts.

Another point more particularly important in the Pacific is the wide distribution of fixed points by which the dead reckoning may be positively corrected. The imperfection of observations for longitude, the errors in the rates of chronometers not ascertained but at long intervals, all tend to throw discredit on allowances for current—the usual scapegoat for all such errors.

There is one source of error which, until recent times, has passed unregarded by most, and that is, the local attraction of a ship on her compass. Invariably a compass will be directed to different points according as the direction of her head is varied. In many cases this will amount to one point or more, varying at different times and places according to the trim of the vessel or the magnetic position. This local deviation is usually greatest when the ship's head is East or West, or rather when at right angles to the magnetic meridian. With such an unsuspected source of error in laying down a ship's course, it cannot be a matter of surprise that great discrepancies will be found between her actual and calculated positions. And should all the causes of error that we have enumerated combine to act in one direction, and that direction be attributed to the effect of current, much confusion and doubt must naturally follow.

The current streams of the Pacific are not generally so strongly marked as they are in the Atlantic; and, in many cases, in the open ocean their entire effects would be comprised within the limits of the possible errors from the above sources. But we are not entirely dependent on desultory observations for our knowledge of the Pacific currents, imperfect though it be. Several navigators of high scientific character, with every appliance, have made the currents the subject of long-continued observation, and it is to their labours that we owe the positive groundwork on which the system rests.

The varied action of the wind is certainly most powerful on the surface of the ocean in producing or varying the *surface* currents. To what depth beneath the surface its power descends is not exactly known, but there is a sufficient body of water set in motion to counteract altogether, or to considerably modify, the currents, whose depth is unquestionably very great.

As it is the surface currents which alone actuate a ship's course, these transient drifts, then, have in reality the same importance as those well-marked and permanent currents whose course is understood, and were it not for this cause, might be infallibly calculated on. It must be to this source that we must attribute those partial drifts which have been encountered in opposition to the general system of the currents, perhaps occasioned by the opposite verge of a revolving storm, which, as is well known, frequently causes a revolving or storm current; on opposite sides of such a meteor we may then find opposing currents,

whose effects do not cease until after the exciting cause has passed away into other localities.

The surface drifts may not be very deep, but they may overlay a more powerful current moving in a very different direction; this is frequently found to be the case, and therefore the surface motion may not give any just notion of its real nature.

Violent winds have one effect on the water—that of disturbing the strata, the lower and cooler portions rising to the surface, and thus occasioning veins or streaks of differing temperatures. This becomes more manifest when the storm waves reach a shelving coast, and the deeper lying portion of the water becomes thus lifted to the surface.

These remarks bring us to another subject—that of the temperature of the ocean. In the ensuing remarks it will be seen that temperature is perhaps the most important element in ascertaining the origin of a current. It was proposed, in former years, to navigate a ship by means of the thermometer, but later observations have shown that the system is founded on a fallacy

The origin of the idea most probably arose from the fact of vessels approaching the eastern American coast from Europe finding a very great decrease of temperature on and within the edge of soundings. But this is now otherwise explained. The warm Gulf Stream skirts this bank in a northerly direction, but *inside* it a *cold* arctic current sets to the southward, and occasions the phenomenon. The same holds good on the Newfoundland banks, the Gulf Stream skirting their southern edge.

A shoal may have cooler water over it from the fact of the lower strata of a current being diverted *upward* by its shelving sides, and this would be particularly the case after any great disturbance of the surface waves. In the Pacific, therefore, but little dependence can be placed on the thermometer as a safeguard or warning of approach to shoal water or dangers.

The Pacific Ocean being of so much greater extent than the Atlantic, it follows that many of the causes which operate to create a complexity in the current systems in the latter do not apply to the former. In carefully examining the tables of observed temperatures which have been made, particularly by M. Tessan, in the French frigate *La Venus*, it is evident that in the open ocean, beyond the influences of the land, the variations both in the air and water are comprised within very narrow limits, both as to the diurnal and secular changes. Thus between the tropics the difference of the mean between the hottest season and the opposite does not exceed 3° or 4° F., and therefore that of the water, as acted on by these causes, must be limited to the same amount. From these facts it is manifest, says M. Tessan, that if we find a variation exceeding 6° or 8° in the temperature of the water in neighbouring points, or in those distant from each other, but lying in the same latitude, it must denote the presence of a current of warmer or cooler water.

These are the chief points connected with the phenomena of currents; more

extended particulars will be found in our North Atlantic Memoir, 14th edition, where these questions are amply discussed, and references to numerous authorities are there given. Our present task being confined to those met with in the Pacific, we proceed to their consideration in detail.

The general system of currents in the Pacific is thus concisely described by M. Biot, who has examined with great care the recent and first observations on this subject:—

Two currents remarkable for their force, traverse, like two immense rivers, the whole of the regions of either ocean, the Atlantic and Pacific. That appertaining to the latter seems to flow from the extensive line of antarctic coast discovered by Sir James Ross in 1841, and from the great icy barrier which extends from thence towards the pole, perhaps as far as the pole itself. At its entrance into the Pacific this current advances to the North; but before New Zealand it trends to the East, and proceeds until it strikes the western coast of Patagonia. This obstacle separates it into two branches. The minor one redescends towards the South and doubles Cape Horn, the principal one turns to the North, following the coasts of Chile and Peru, lowering the temperature of these countries. But when it reaches the Equator its further advance to the North is prevented by the tongue of land lying obliquely to the meridian, which connects the two Americas. Meeting with this it turns to the West, thence continuing to advance with scarcely any obstacle in this direction until it is again arrested by Oceania, the Indian Archipelago, and the Asiatic continent. Arrived here, it subdivides, following the inflections of the coasts it strikes against; one branch flowing to the East of Oceania trends to the South; another enters and is lost in the Indian Archipelago; a third, reflected by the eastern coast of China, turns to the northward. But this soon meets directly in its course with the Japanese Archipelago, the Peninsula of Kamtschatka, and the eastern prolongation of Siberia. Besides this, it is driven towards the Equator by the polar current which issues from Behring's Straits. Under the combined influence of these causes, its course bends to the eastward, and following the direction now quite open to its progress, it proceeds to the western shores of North America, above the Oregon territory. Again deflected from its eastern course, it bears to the South along the Californian coasts, and again entering the great equatorial currents it bears away once more to the westward.

By this movement in continual circulation the cool waters coming from the South Pole become heated under the Equator, and at length moderate the region of the northern climate they next reach. Thus the branch of the equatorial current which ascends to Kamtschatka is the cause that the sea never freezes round the northern extremity of the peninsula.

Each branch of this system will now be considered in its turn.

1. ANTARCTIC DRIFT CURRENTS.

It has ever been considered that from the polar regions the waters of the ocean move first in a direction towards the equator, and then toward the East, where, from the configuration of the great continents, they are forced to the northward, and at last uniting with the equatorial drift, bear away to the West, and maintain the equilibrium.

That the former portion of this assertion is at least correct in some degree is shown by the floating masses of ice, which, being detached from their parent locations, are annually brought within the region of more temperate climates in the spring and early part of the summer. However theories might be reconciled with the limited knowledge we possessed till within a recent period, late discoveries must tend to subvert partially the preconceived notions of the origin and progress of the northerly drift from the antarctic polar regions.

Much of the speculation as to the origin and progress of these moving masses of water, however, cannot prove useful to the navigator, as too often a more extended examination, embracing more minute particulars, nullifies, or perhaps reverses, the previously conceded axioms. Such may be the case with this antarctic drift. As far as has been ascertained, the whole mass moves in a northerly and easterly direction to the South of New Zealand, about the same at Cape Horn, at the rate sometimes of 20 to 35 miles per day.

Sir James Clark Ross, in his last antarctic voyage, made several experiments in deep sounding and temperature. One of these was on January 3, 1842 (nearly midsummer), in lat. 66° 34′ S.; the ships were enclosed in a field of ice, without visible limits, when they let down a sounding line of 945 fathoms, with attached thermometers, which, contrary to all preceding theories and experiments, showed a constantly *increasing* temperature from the surface, at 36° to 39°·5 Fahr. This extraordinary result, so totally at variance with all that had been previously observed, opened a fresh field for speculation.

Following up the experimental investigation, Sir James Ross assumed that there was a zone in the southern hemisphere in the mean latitude of about 56° 26′, the water of which possesses the same unvarying temperature of 39°·5 from the surface down to the bottom.

Thus, supposing there is a similar belt of uniform temperature in the northern hemisphere, the two would separate the waters of the globe into three great thermic basins, two towards each pole of the earth, and a third through the central part of which the equator would pass. In these zones, then, the whole body of ocean water is of uniform temperature from the surface to the bottom, while on the North and South of them, towards the tropics and equator, water of a higher temperature would float above it, and in those nearer each pole the surface water would be colder.

But in the later deep sea experiments, especially in those made on board

H.M.S. *Porcupine* in the arctic seas, in 1869-70, and on board H.M.S. *Challenger*, in her voyage round the world, it has been fully demonstrated that the thermometer bulbs, unless protected, are seriously affected by the enormous pressure they are subjected to in their descent to such great depths, and that consequently the recorded temperature is greatly in excess of the true reading of the index, and therefore any theory based upon such evidence must be fallacious. Therefore the views promulgated by Sir James Ross must be abandoned.

When at the edge of the pack ice (in the antarctic sea) the temperature of the water was always between 28° and 29°. At a short distance from the pack the surface water rose to 32°, but at a depth of 40 fathoms we always found the temperature to be 29°; this continued to 300 fathoms, the depth in which most of the icebergs float, after which there is a stratum of slightly warmer water of 33° or 34°. It was impossible to obtain the exact temperature of the bottom whilst near the ice, but the observations made in lower latitudes show that it is about 31°.—*Capt. Nares*, H.M.S. *Challenger*, 1874.

Some further observations on the Density, Temperature, and Depth of the Ocean, will be found hereafter, in Section II. of Chapter XXIII. of this work.

There are many difficulties in fully accounting for ocean circulation, especially those of deeper movements which are known to exist, but which can neither be accurately measured nor connected with any surface phenomena. In the South Pacific there have been, relatively, so few data acquired, that it is only from analogy with other oceans, especially with the North Atlantic, that any argument can be raised. As these speculations do not affect the seaman's practice, they will be left to other works. In our book on the North Atlantic Ocean before referred to, there will be found many elucidations of this branch of hydrography.

2. CAPE HORN CURRENT.

It has been stated that the drift current from the antarctic regions, after proceeding to the eastward, strikes the Patagonian coast, and separates into two branches, the southernmost of which is that now to be considered.

Its existence has been questioned, and even denied; but more complete examinations have determined its character, and we here give some of the facts upon which it rests, apart from any speculative ideas.

The first experiments which afford undoubted evidence were those made by the lamented Capt. Henry Foster, R.N., in H.M.S. *Chanticleer*. From the appendix to the account of his voyage we extract the following:—

At the distance of 10 or 12 miles to the southward of Cape Horn there is a current running to the E.N.E., at the rate of about 1 mile per hour; but in what manner this current may influence the tides near the shore, or what

changes may be produced in the direction and the strength of the current itself by the flood and ebb tides, will require a very extensive suite of observations to ascertain.

The circumstance of there being no well-authenticated account of the existence of a current to the southward of Cape Horn, induced me to throw together the following observations upon that subject, made during the passages of H.M.S. *Chanticleer* from Staten Island to Cape Horn, from Cape Horn to South Shetland, from South Shetland to Cape Horn, and from Cape Horn to Staten Island, during the summer and autumnal months of those regions.

The ship's way through the water was measured by Massey's self-registering log, and the variation of the directing compass was ascertained by actual observation on the course steered, whenever the state of the weather would permit. The local attraction of the *Chanticleer* did not exceed 2° in extreme cases.

The observed places of the ship were computed with every possible care and attention. The effect which these observations appear to point out, is that of an easterly motion of the sea, in the vicinity of Cape Horn, produced no doubt by the prevalence of N.W., West, and south-westerly winds; and although its direction is sometimes much to the North, as well as to the South of the East, this deviation, in all probability, arises from the prevalence or greater strength of the N.W. or S.W. winds during the intervals between the observations, as it was generally remarked that the current's deviation from the East, towards the North or South point of the compass, was in accordance with the prevalence of one of these winds over the other during the interval.

The strength of this set appears also to be much influenced by that of the winds, for, during the voyage from Cape Horn to South Shetland, it was found, at the time of meeting with N.E. winds, in the parallel of 60° S., that the set to the eastward was diminished in its velocity to about half the amount we had previously experienced. From these several irregularities, the individual observations do not admit of any very satisfactory conclusions being drawn; but taken collectively, they indicate an easterly or north-easterly set. The result of the tables shows that in the voyage from Staten Island to Cape Horn, a current setting N. 80° E., at the rate of 12 miles in twenty-four hours, may be expected in the summer months, and that between Cape Horn and South Shetland a current setting S. 65° E., of equal strength, was experienced during the same season of the year; while in autumnal months this current was found to set N. 49° E., with nearly twice the velocity; and on one occasion, in May, 1829, the set was N. 51° E., 54 miles in twenty-three hours. All this seems to indicate that the winds from the south-western quarter, in autumn, are more violent and of longer duration than in the summer season; and indeed, on a review of the winds during the passages in the different seasons alluded to, it was found that N.W., West, and S.W. winds exceeded

those from all other quarters put together; in the month of March, in the ratio of four to one; while in the summer months, and during an equal interval, these winds were found to exceed all others in the ratio of two to one only, which points out at once, apart from other circumstances, that the most advantageous part of the year for rounding this noted promontory is the summer months of those regions. And, from the strength and frequency of the gales that were experienced in the month of March, I am induced to recommend the summer season as the proper time for the navigation of those seas, particularly as at that season north-easterly winds may be expected in the parallel of 60° S., and as, in all probability, they continue to blow in a high southern latitude throughout the summer, for we found the north-easterly winds to be the prevailing winds during our residence at South Shetland in the months of January and February.

The next and most important conclusion to be drawn from these observations is, that the set of the flood tide round Cape Horn comes from the S.W.; such, at least, seems to be the case from the observations made during the passage of the *Chanticleer* from Cape Horn to Staten Island, in May, 1829; when, at the time of taking our departure from Cape Horn, it was ascertained to be nearly low water, and on our arrival off Cape St. John the flood tide had just made its mark. The passage from Cape Horn to Staten Island was performed in twenty-three hours, in which interval we had felt the whole influence of the two flood tides, while that of one ebb only had been experienced; and on comparing the ship's place, ascertained by bearing at the time of our departure from Cape Horn, with dead reckoning on our arrival off Cape St. John, and kept in the most unexceptional manner under very favourable circumstances, viz., fine weather, a free though side wind, and the ship's way through the water measured with a self-registering log, a set N. 51° E. (*true*), at the rate of 54 miles in 23 hours, was experienced; from which, if 24 miles be deducted for the effect of the previously established current at this season, we have 30 miles for the set of the flood tide at *neaps*, or about 3 miles per hour. It is also to be considered, that in advancing to the eastward the flood tide is prolonged, and, on the contrary, the ebb is curtailed. How far the strength of these tides may have operated in producing some of the irregularities in the north-easterly set of the sea, deduced from the previous observations when near in-shore, by having been influenced by either tide for a longer period in the interval between the observations, I have not ascertained; but from some notes which were made at the time, I have every reason to believe that the tides caused part of the irregularities in question.

Capt. Wilkes states that he tried the temperature of the water to the East of Cape Horn at the depth of 450 fathoms, and was much surprised to find it only 28°, that of the surface being 44°. This remarkable depression was not verified by other observations, as the next morning he was in soundings of 80 fathoms; bottom temperature 46°, surface 49°, but of the correctness of the

observations there was no doubt. This certainly demonstrates that the polar current trends around this promontory. Perhaps this might have been a stratum of cold water, raised to a higher level from passing the coast.

D'Urville also found a current setting to the E.N.E., along the icy barrier of Powell's Group; this must be another portion of this great connecting current. That it is not limited to the vicinity of Cape Horn is evident by the drift of the icebergs, which are carried beyond the line where the current is found at the surface, by submarine streams acting upon their submerged portions,—a fact well known and familiar on the Newfoundland banks and the northern edge of the Gulf Stream.

These ice drifts, as will be shown presently, have a N.E. tendency from the southward of Cape Horn, for they have been met with in large quantities up as high as 40° S. latitude at 50° E. of Cape Horn.

There is another incontrovertible evidence of this easterly set round Cape Horn, which, having passed beyond its meridian, bears more to the northward, in the fact of the drift-wood, &c., found on the southern shores of the Falkland Islands. In some places on the coast open to the South and West great quantities of it will be found, and there are few places between Cape Orford and Choiseul Bay where a ship could not find a good supply of fuel. This wood comes from the shores of Staten Island and Tierra del Fuego, and in confirmation of its origin, portions of Fuegian canoes are also met with in the same localities.

In respect to its strength, it may be stated that great quantities of drift, kelp, water-worn trunks and branches of trees, &c., are met with at sea to the north-eastward of the Falklands, indicative of this N.E. current, which have been found at 200 miles to the N.E. of Berkeley Sound. Its velocity, probably, does not ever exceed 2 knots; its actual set, perhaps, being even less than 1 knot.

3. THE PERUVIAN OR HUMBOLDT'S CURRENT.

The waters of the South Pacific Ocean, apparently from their northward and eastward tendency in high latitudes, described in page 1112, form a current on the West coast of South America, which extends as a mighty river of cooler water from the latitude of Chiloe to the Galapagos Islands on the equator. From its becoming more evident in the warmer and lower latitude of Peru, it has been denominated the Peruvian Coast Current; from its having been first distinctly explained by the great naturalist, it has been termed Humboldt's Current.

Its effects, however, have been long known. In a very early day after the conquest of America, the Spaniards learned to cool their drinking vessels in its frigid waters in the Bay of Callao, a practice still continued. Another evidence, now traced to the correct source, is the cooler climate which many parts of

Peru enjoy, to what their geographical position and natural character would otherwise cause. This is also the cause of the *garau* or haze, which for months together obscures and cools the air in the Peruvian plains. These fogs commence in the morning, and are not dissipated till noon, and reappear in the form of heavy dews at night.

The first elimination of this current is due, as above stated, to Humboldt, in the autumn of 1802. The account was published by Professor Berghaus, in his Physikalischer Atlas, from the baron's manuscript, from which the following extracts are taken:—"The first concern of a traveller, on arriving at the sea-coast, after a long absence in a mountainous country, is to observe the height of the barometer and the temperature of the water. I was occupied with the latter in a district between Truxillo and Guaman, near the Callao de Lima, and on the voyage from Callao to Guayaquil and Acapulco, on a tract of the Pacific Ocean of more than 400 miles in extent, when, to my great surprise, I found that the temperature of the surface of the sea under latitudes where, outside of the current, the temperature ranges from 78°·8 to 83°·3, was at Truxillo, at the end of September, 60°·8, and at Callao, in the beginning of November, 59°·9. The temperature of the air was in the first period 64°·04, in the second 72°·86, and then (which is of importance to remark) 12°·6 warmer than the oceanic current."

This temperature was found to be uniform at Callao, at night only 0°·7 colder than by day; so that the air could have but little to do with it, as will be more clearly shown presently. Once only did a variation occur; an immensely high and hollow breaker dashed suddenly in on the shore. Whether this arose from the effect of a submarine earthquake, as is usually considered by the inhabitants, or the effect of a distant storm, the result was that the water was cooled down to 59°·9 and 58°·35 in a few hours. This is easily conceivable; the lower and cooler strata of water had been disturbed by the increased surface action, and thus becoming incorporated with the upper portion, lowered the temperature. Or it might have arisen from the lower strata of water being driven up-hill toward the shore by the action of the waves, as may be supposed to be the case when a current meets a shoal, and causes the surface temperature to be sensibly lower, from the same mode of action.

From the beginning of November to the end of December, Humboldt observed that the temperature gradually and regularly increased, until it reached the height of 69°·8,—a fact more fully established afterwards by Duperrey in 1828. This would accord perfectly with the climate of high southern latitudes.

That it is not a mere surface action is manifest; a current of cold surface water in temperate climates would soon be precipitated to a lower position by virtue of its greater specific gravity. Nor is there anything in the climate

to cause such an anomaly. Besides, we have the direct evidence of the experiments of M. du Petit Thouars to establish the fact of its depth.

On April 16, 1837, the frigate *La Venus* was to the S.W. of Chiloe (lat. 43° 47′ S., long. 83° 46′); the weather being perfectly calm, and the frigate carrying no sail, a line of 1,000 fathoms was let down, carrying a self-registering thermometer. The sounding-line appeared to be perfectly perpendicular, nevertheless the frigate was drifted from South to North, with the velocity of the surface current she was in. If the lead and the case of the thermometer had not found in the descent a stratum of water moving in the same direction, and with equal velocity with that of the surface, it would have swerved from the perpendicular, and the variation from this perpendicularity would have demonstrated the difference in direction and strength of the deep-seated currents, but none such was observed.

The Chilian or Peruvian current cannot, then, be considered as a simple and superficial river of cool water. It is produced by large portions of the waters of the polar sea advancing majestically from South to North. The body of the current reaches to and beyond the equator, where it is not less than 973 fathoms in depth.

Besides this, we have other facts of its real depth gained during the same voyage. At the experiment above mentioned, to the S.W. of Chiloe, the temperature at the surface was 55°·7; at 445 fathoms 39°·5; and at 980 fathoms (no bottom) 36°·2. Afterwards the *Venus*, at Pisco, to the South of Lima, where beyond doubt the same current exists, found the surface of the sea was 66°·2, and at 117 fathoms it was 55°·9.

Thus, in its passage from Chiloe to Pisco, the surface water had become 10°·5 warmer, while that at 117 fathoms, as may be inferred from the proportional part, had gained only 4°·5.

The limits and extent of this current, or rather, perhaps, we might say, of the superficial portion of it, must vary. As stated in the outset, the cold current bearing to the N.E. from the Antarctic regions, strikes the coast of America about the parallel of Chiloe or Concepcion.* Its breadth, therefore, as far as the latitude of Valparaiso, is open to conjecture; at all events, it is not very rapid in this portion of its course, and therefore more liable to be neutralized by the effects of the winds acting on its surface.

Admiral Du Petit Thouars, in sailing from Easter Island to Valparaiso, in March, 1838, which course is nearly on a parallel, found the temperature of the surface to decrease very gradually through the whole of the track; thus, March 1, lat. 29° 56′ S., long. 111° 8′, mean temperature, 75°, current, S.E.;

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* The change in the direction of this N.E. drift to North is about the Island of Mocha. The frequent wrecks on the coast of Chili are an evidence of this set towards the shore, and another is the difficulty vessels have formerly experienced in gaining a sufficient offing in leaving Valparaiso in order to double Cape Horn."— *Wilkes.*

March 5, lat. 32° 37′ S., long. 97° 45′, temperature 72°; March 10, latitude 32° 44′ S., long. 87° 24′, temperature 69°; March 17, lat. 33° 3′ S., long. 79° 14′, temperature 67°; the current throughout all this period had been more or less to the *eastward;* March 19, lat. 33° 2′, long. 76° 44′ temperature 59°·7; so that, according to this, perhaps the most direct observation in this latitude, there is not any very well defined western limit to it.

Nor does the outer boundary to the North of this appear to be exactly marked by a change of temperature; but its effects may be felt at the distance of 500 miles off the land, in lat. 26° 30′, though it here shows 67° of Fahrenheit, demonstrating that it merges gradually with the warmer body of water to the westward.

Off Callao it would seem as if the trend of the land drove it from the general northerly course parallel with the coast, which it maintains to the southward of this, and on this parallel we may look for the southern limit of its westerly drift at times, but this appears to vary considerably. Captain Wilkes says that he found the breadth of this stream to be about 100 miles off Callao, but gives no particulars of his observations.

M. Tessan found, in one spot, about lat. 9° 20′ S., long. 107° 50′, a singular equality of temperature at the interval of four months (February to July, 1838), it being at both times 77°·5; and here he considers that its southern limit must be placed.

The estimation of Duperrey, who has done more to the elucidation of the currents of the Pacific than any other observer, will place the fact of the difference of the temperature of this current and that of the mean temperature of the latitude in a clear light:—

	Air.	Ocean.
The mean temperature, as calculated for lat. 12° 0′ S., is	79°·34 ..	79°·70
But at Callao the mean in February and March, 1823, was	68°·36 ..	65°·66
Difference	10°·98 ..	14°·04

At Payta (lat. 5° 6′), Duperrey observed the temperature of the current, March, 1823, between 68°·90 and 77°·0; mean 72°·95; whilst in the ocean, outside this cold current, the mean was 80°·6.

Lieutenant Dirckinck von Holmfeldt, at the request of Humboldt, made a long series of observations on this current in 1824-25, which would place the limit of its North direction at Cape Blanco. The change from the temperature of the cold current to that of the adjoining sea North of the parallel of Cape Blanco, is very remarkable. Between the 4th and 5th of April it rose from 71° and 72° to 80° and 83°.

Notwithstanding all that has been said respecting the existence and character of this northerly current, it does not appear to be so evident to all as to excite immediate attention in those who traverse it. By some its existence is

even denied, though, on the other hand, it would certainly seem without any proper reason.

M. Lartigue, who was in the French ship *La Clorinde*, under the Baron Mackau, in 1822-23, says that the currents always followed the direction of the wind; but his experience would in some degree appear to confirm the observations made by others on this northerly current. He says the *Clorinde* was drifted 2° 10′ to the northward in the space of twelve days in the summer; but in winter the differences to the northward exceeded by 36′ those to the southward in ten days, the predominant winds being from the southward.

M. Lartigue is among the first who noticed a *counter* or *southerly current* running close in-shore, by means of which he has recommended vessels to get to the southward, when other causes combine; we will again allude to this presently, but perhaps it was owing to this (eddy) current that a portion of his southerly drift is owing.

Another observer, whose remarks are entitled to every consideration, is Rear-Admiral Lütke, and he, too, does not coincide with the opinion that this is a well-defined current. We quote his remarks:—"At about 15° to the West of the meridian of Cape Horn, and between lats. 58° and 61°, the currents were very variable, as well in their direction as in their force, and did not at all times obey the direction of the wind. But to the West of Tierra del Fuego, which we rounded at the distance of 300 to 400 miles, and, as far as latitude 46°, with very strong breezes from the S.W. and N.W. quarters, the current ran for six days to N. 52° E., at the rate of 21 miles in 24 hours. The immediate influence of the wind on the current was here very evident.

"After gaining, in lat. 44°, the regular wind which prevails on the American coast, we also expected to find a northerly current, which, as is generally supposed, runs along the coasts of Chili and Peru, and brings the cool water within the limits of the torrid zone. With the exception of the day we arrived in Concepcion Bay, when we found ourselves 14′ further North than our reckoning, we did not have a single evidence of a northerly current, but only some slight currents to the East and West. We attributed this to our great distance from the coast, when we entered the regular trades; but between Concepcion Bay and Valparaiso we did not at any time get very far off the land, and then we did not remark any current to the North; once only we were drifted 13 miles to the N.W.; otherwise, we had no current at all, or else it was to the S.W. During all this period the southerly monsoon only blew for twenty-four hours; the remainder of the time we had light winds from the N.E. or N.W. It may be concluded from this that even here the constancy of the northerly current depends upon the winds from South, and it is from them, perhaps, that it immediately proceeds.

"The daily observations on the surface temperature of the water (by Dr. Mertens) showed nothing more than the ordinary decrease on approaching land, and no evidence of cold-water currents.

"These facts, contrary to the generally received opinion relative to the currents on the S.W. coast of America, were new to us, although the same had been previously remarked by other navigators. Captain Duperrey deduced from a great number of observations, that the current of cool water flowing along the Peruvian coasts reaches low latitudes in coming from the S.W. This current attains the coast of America about the parallel of Coquimbo.

"The currents were variable, between S.E. and N.E., during the time that the very strong breezes from N.W. lasted, which was an entire week during our stay at Valparaiso, and on the parallel of 33°; they might be therefore directly referred to the action of the wind; but once in the course of 24 hours, when the wind blew very strongly, the reckoning did not vary from the observations."

Without giving any opinion as to the relative weight of the remarks here quoted, it may be averred, that as yet the observations have not been sufficiently connected or extensive to draw any absolute conclusions from them. The remarks of Capt. FitzRoy as to these variations from the normal character of the stream, or the periodical or occasional reversion of this northerly current, will be interesting.

"The period at which these *southerly sets* take place cannot be foreseen with any degree of certainty. Neither the seasons, the age of the moon, nor the other causes common on almost every coast, seem to have any influence here. The oldest navigators and men accustomed to the coasting trade, can assign no reason for these changes—they only know that they do take place, and endeavour to profit by them accordingly.

"During the continuance of the survey, these southerly sets were frequently experienced immediately preceding and during northerly winds; but as this was not always the case, no general rule of the kind can be laid down, although it certainly appears to be a natural inference that there is some connecting link between them, which time and attentive observation will yet reveal. It was also remarked that at times the current was setting to the southward, after a fresh wind had for several previous days been blowing from that quarter. And as no inequalities or irregularities in the coast line seemed to have occasioned this, it only served to awaken curiosity, without affording any clue to discover the source of these singular but interesting anomalies."

It is perhaps at the Galapagos Islands that the evidence of the Peruvian current becomes most manifest. The currents, from the concurring testimony of all voyagers, are most remarkable in the vicinity of this archipelago. The thermometer would indicate to a certainty the origin of these strong currents, which chiefly bear to the North and West, but in the earlier voyages no notice has been taken of this feature. Colnett notices the drift-wood, bamboos, wild sugar-canes, and small cocoa-nuts, lying on the S.E. side of Chatham

Island. Capt. FitzRoy mentions one fact which bears very strongly on the subject. The *Beagle* was here in October, 1837. On one occasion the temperature of the sea a foot below the surface, on one side of Albemarle Island, was found to be 80° Fahr., but at the other side of the island *it was less than* 60°. This is a surprising variation, and well worthy of attention to future navigators, who may easily and readily do great service to hydrography by making and recording such observations.

This low temperature of the water, constant or fluctuating, has one remarkable effect, according to Mr. Dana—the absence of all coral reefs around the Galapagos, though they lie much within the limits of the temperature in which the coral building insects can live.

We will cite a few remarks that have been made in the vicinity of these islands, as it appears that they lie on the verge of different current systems.

First, between Cape Blanco and the Galapagos, Capt. FitzRoy was set 50 miles to the W.N.W. in the twenty-four hours preceding his making the archipelago from the S.E. Capt. Worth, of H.M.S. *Calypso*, also found the set to be 25 miles per day to the North and West, in 1848. H.M.S. *Conway* was also set to N.W. at the rate of 1½ knot, in November, 1834. Lieut. Foster found the current setting N. 64° W. at the rate of 1½ mile per hour, at the S.E. part of the group.

Passing to the northward of the archipelago, Colnett found it run so strong to the westward that he was seven days in recovering his position, after killing some spermaceti whales. To the North of Narborough Island he states that it runs 4 or 5 knots to the North. This was in the summer. Lieut. Foster says that a careful comparison showed the current to run 30 miles N. 60° W. in twenty-four hours at James Island. Captain FitzRoy says:—While sailing away from the Galapagos we were impelled westward of a smooth sea, not only by favouring easterly breezes, but by a *current* which set us more than 60 miles to the West during the first twenty-four hours after our losing sight of Culpepper Islet, and from 40 to 10 miles each subsequent day, until November 1st, 1835, in lat. 10° 14′ S., long. 120° 35′ W. Thus far as to the north-westerly set of the current around the Galapagos.

To the northward of the line between Cape Blanco and the archipelago there appears to be a conflict between opposing currents. Though we have no observations as to the relative temperature of these varying streams, yet there is little doubt but that great differences would be found in those which have a southerly set, and those to the northward of West.

Capt. Colnett relates a remarkable instance:—In the course of our passage from Cape St. Elena to the Galapagos (June, 1793), we fell in frequently with *streams of current*, at least a mile in breadth, and of which there was no apparent termination. They frequently changed the ship's course, against her helm, half the compass, although running at the rate of 3½ miles an hour. I never experienced a similar current but on the coast of Norway. The froth

and boil of these streams appears at a very small distance like heavy breakers. We sounded on several of them, and found no bottom with 200 fathoms of line. I also tried the rate and course of the stream, which was S.W. by W. 2½ miles an hour. These streams are very partial, and we avoided them whenever it was in our power. Birds, fish, turtles, seals, sun-fish, and other marine animals, kept constantly on the edge of them, and they were often seen to contain large beds of cream-coloured blubber, of the same kind as those of a red hue, which are observable on the coast of Peru. This is very decisive as to the meeting of different currents. In another part, further to the North, Captain Colnett found the current running to N.E. 30 or 40 miles a day. Captain Worth, of H.M.S. *Calypso*, also noticed strong rippling in the space between the islands and the main.

The great bay formed by the continents here seems to be subject to very varying currents, apparently influenced by turns by the Peruvian or by the Mexican currents, according as the relative strength of either becomes greater. Thus Malpelo Island, says Colnett, is surrounded by a strong current, having much the appearance of breakers. This he found setting strongly into the gulf, toward the Bay of Panama, accompanied by light winds, with thick and hazy weather, at the rate of 2½ miles per hour, to N.E. by E. by compass. Another writer says that they run violently to the South and West. That these varying statements should be equally correct is not at all incompatible, though we have no data from which to judge when the inset or outset from Panama Bay occurs. This uncertainty somewhat embarasses the navigation between the Galapagos and Panama. Colnett remarked this on his passage from Quibo Island to the former; he passed through strong ripplings and veins of current bearing to *West;* at another point they might have set to *East.*

This is, probably, another evidence that the Peruvian current is not altogether diverted at Cape Blanco, as has been supposed by Humboldt and others; it is evident, from what is above stated, that at times it runs to N.E. in the offing; and just to the eastward of Cape San Francisco, off the town of Atacames, is a long shoal spit running out 11 miles from the land; it is mentioned in the description. This and the irregularity of the depth off this part of the coast may warrant the inference that they are the effect and result of the strong and conflicting currents which set into and out of the bay.

This part of the subject need not be pursued further. From what has been above shown, but little dependence can be placed on the certainty of any particular drift in this quarter. Therefore the navigator must be guarded against their insidious and violent effects.

Of the *velocity* of the Peruvian current, in addition to the remarks incorporated above, the following may be quoted.

Humboldt writes:—An intelligent Spanish seaman, Don Josef de Moraleda, commanding the ship in which I made the voyage from Callao to Guayaquil, assured me that in the archipelago of the Islands of Chonos and Huaytecas,

the coasts of which he had explored, he found the movement of the water which flows along the coast towards the North to be very slow. On the surface it only moved at the rate of from three to five-tenths of a mile per hour, as in a drift-current; but careful observations with the lead had shown that, at a depth of from 12 to 15 fathoms, the current in the same direction is much stronger. The agitated parts of the water, flowing between warmer layers, long maintain the low temperature of higher latitudes, and remain at a depth corresponding to their specific gravity.

The United States' Exploring Expedition estimated the effect of current in the passage between Valparaiso and Callao as 171 miles, but the direction was nearly due West; so that the trend of the land deflects the current from its northerly course, which it again resumes after passing Pisco.

Between Cape Horn and Valparaiso Capt. Wilkes states that he found the drift to be 254 miles, in a direction N. by E.

Humboldt says:—"From Valparaiso and Coquimbo, but especially from Arica, North to Lima, the current at the strongest runs from 12 to 14, and sometimes even 18 miles in twenty-four hours.

"In this, as in other currents, when it meets with an impediment by striking the coast, its velocity is increased, and thus the greatest rate is close in shore. The force of this current is the cause why ships which, at the time of the garau, sail from Quilca to Callao cannot obtain sights for latitudes during long intervals; the fog, too, preventing their making out the land, they are drifted unexpectedly to the North of Callao to Huaura and Guarmey, and still consider themselves to be, according to the dead reckoning, to the South of their port. This haze is most dense between Pisco and Lima."

4. THE EQUATORIAL CURRENTS.

This great extent of moving water, obeying the same general law as the trade winds, advances across the entire breadth of the Pacific, from the coasts of Central America to those of the Indian and other archipelagoes in the West, within the tropical limits.

It must not be understood, however, that the whole space above indicated is occupied by one unvarying westward tendency of the currents, inasmuch as many anomalies and conclusions apparently opposite to this notion may be derived from the observations that have been made. Yet the general assertion is correct. Why it is that the currents should be in many cases quite imperceptible, or even flowing in a contrary direction to that which all reasoning and analogy, drawn from known facts, would indicate, is a problem yet to be solved. In the remarks made upon the winds in previous pages, it is shown that the trade winds in the Pacific, away from the influence of the land, have not that permanence and steadiness characteristic of their nature in other parts of the world. The same with the equatorial currents: they seem to be neither permanent nor regular; at least so far as regards

those superficial portions with which the ordinary navigator has to deal. As is stated in the preliminary observations to this chapter, the great mass of waters may be moving in an opposite direction to that which the drift of a ship may indicate, as her immersion may not reach below that portion which may be immediately affected by the wind. What the extent of this action of the winds may be it is difficult to estimate, but the movement occasioned by the surface vaves does not reach to any very great depth—3, 4, or 5 fathoms at the utmost in ordinary cases; but, by accumulated impulses in one direction, a greater mass of water may be set in motion in that direction, and overlay a mass in a state of rest, or moving in another direction. There can be but little doubt but it is in this way that the absence of currents, or partial reversing of their directions, may be accounted for. And also, that if more extended and careful observations were made upon the substrata of the ocean, it would be found that the waters of the Pacific are moving majestically in one unceasing circulation, regulated by one unvarying law. Therefore, as far as the surface of the ocean is concerned, the mariner may expect, but must not depend on finding, westerly currents within the tropical regions.

Captain Duperrey, who has devoted much labour to the elucidation of the currents, places the southern limit of the equatorial current, beyond the influence of the continent, at lat. 26° S., and its northern border at lat. 24° N., or (partially) occupying a zone of 50° in breadth. It is more than probable that these latitudes may vary at the different seasons.

Commencing with the S.E. portion, it must be remarked, that the cold Peruvian current forms a portion of its initiatory course. This current, previously described, first assumes a direction to the West of North in about lat. 20° S., near the South American coast; and in long. 108° W., its southern limit, as evidenced by its low and equable temperature (77°·5) was found by M. Tessan to be in lat. 9° 40′ S.

It is probable that in this eastern portion the current may be less strongly marked than farther to the West. For Capt. Lütke states that he did not find any current in his passage between lat. 20° S., and long. 81° W., and 28° S. and 116° W., a distance of 2,400 miles.*

* Berghaus places a *counter current* on this chart from the observations made on board the Prussian ship *Mentor*, October 20—26, 1823, on her passage from Coquimbo to the Sandwich Islands. The current she met with in crossing the tropic of Capricorn, that is, from lat. 26° to 21° 20′ S., long. 75° to 82° W., was directly to the *East*—that is, opposed to the direction of the equatorial current. Whether this was only a partial and temporary stream, or whether it is due to some hitherto unexplained and constant cause, is not yet decided. The passages of Kotzebue and La Perouse do not contradict, nor do the above remarks of Lütke, who traversed the space April 23 and 24, 1827, negative the existence, although the Russian commander does not add his testimony to the existence of the apparently well-defined Peruvian current. It has been placed on the charts alluded to as the *Mentor's counter drift*, though more observation is necessary to establish its existence. Should this be done, its name would be appropriate.

Between Callao and Tahiti, after crossing the polar stream, Wilkes experienced little current. Among the islands of the Paumotu Group, none whatever was perceived, and the whole drift was no more than 17 miles in a N. 57° E. direction.

At the Marquesas it generally sets to the westward between N.N.W. and W.S.W., and its velocity is about half a mile an hour.

Concerning its velocity, Captain Wilkes found it running to the S.E. at the rate of half a knot against the wind, in July, 1839, lat. 15° 30′ S., long. 99° 30′ W.

At Disappointment Island, on the North of the Low Archipelago, the current ran to the West at a mile an hour.

To the South of Pitcairn Island it ran 34 miles a day to the *East* in a N.W. gale, January 9, 1837.

In the southern part of the Low Archipelago, Capt. Beechey found it running strongly to the South.

Capt. Scott, of H.M.S. *Samarang*, estimates the current at Christmas Island (lat. 15° 0′ N., long. 157° 30′ W.) to run 37 miles per day to S. 84° W., September 11, 1840. Proceeding to the N.W. on the following day, in lat. 2° 30′ N., long. 158° 50′ W., S. 80° W., 11¾ miles; September 13th, lat. 3° 20′ N., long. 160° 20′, West, 25 miles; September 14th, lat. 4° 10′ N., long. 161° 40′ (to the East of the Samarang Islands, then discovered), S. 45° W., 10 miles.

On September 16th, Capt. Scott fell in with the easterly counter-current, presently described, which drifted him, in lat. 6° 50′, to N. 33° E., 50 miles in the twenty-four hours; but on the following day, in lat. 8° 45′ N., the equatorial current again set to S. 72° W., 25 miles per day.

Very strong currents were experienced by H.M.S. *Challenger*, on her passage from Honolulu to Tahiti, August–September, 1875. From 5° N. to 5° S. the current was running to the westward at an average rate of 43 miles per day, but in 1° N. its speed was no less than 70 miles per day, which rate was also experienced by the French corvette *L'Eurydice*, in August, 1857, in 3° 50′ N. Its temperature varied from 79° to 77°, being 77° at its axis of greatest rapidity. From 5° S. to Tahiti the currents were to the southward about 12 miles per day.

Beyond the Fiji Islands, to the westward, a S.W. current prevails (Wilkes, vol. v., p. 472).

Between the Society and Navigators Islands, Wilkes considered that no current exists. The distance is about 2,000 miles, and in his passage, which occupied fourteen days, his drift only amounted to 43 miles, in a N. 9° W. direction. On approaching the latter group, the temperature of the water rose a few degrees, indicating, as he surmises, that there was no cold submarine current.*

* Captain Wilkes mentions cases in which the Polynesian Islands were occasionally

Around the Samoan Group a current appeared to revolve : for on its southern side it set continually eastward, while on the northern side it set to the West. The current is weaker near the shores, and is not fully developed until at some distance from the islands. This phenomenon has little connection with the tides, and does not appear to be connected with the general system ; at least we are unable to account for it on general principles. A knowledge of its existence is, however, of importance to the navigator, as advantage may be taken of the easterly direction of that part to the South of the islands in beating to the windward.

After leaving the Fiji Group, Wilkes did not experience any current until he reached the latitude of 8° South, and then only in separate impulses. He then experienced currents for three or four days, whose united effects amounted to no more than 20 or 30 miles, in a direction about S. by W. In passing the Phœnix Group a variable current was experienced, and little seems to exist there at the season when he passed it ; but in the following January, when the *Peacock* was at this group, a current was found setting to the westward, which was lost on passing a degree or two to the South. In this voyage of the *Peacock* a space in the ocean was traversed remarkable for elevated temperature, which was as high as 89°. The waters of this space, therefore, do not enter into the general circulation.

Approaching the western end of this southern equatorial current, that is, to the West of the Fiji Archipelago, we find that the currents vary considerably in their direction, and moreover are frequently very violent.

A portion of this has been called *Rossel's Drift*, to the N.W., off the New Hebrides, New Caledonia, &c. Berghaus has applied this name from its having been announced from the observations made in D'Entrecasteaux's voyage by Admiral Rossel. But it can scarcely deserve the name of a permanent current, as the following extracts will demonstrate.

On the eastern side of the reefs extending to the N.W. of New Caledonia, D'Urville found the current setting to the N.N.W., 34 miles a day, in June, 1827.

In the Nautical Magazine for 1842 are the following remarks :—Off the islands, so far as my observation extends, the currents decrease in strength in proportion to the increase of latitude, that is, the nearer to the Equator the stronger the current, and generally with the wind. There are no doubt many exceptions ; but without an account of each island, which I am unable to give,

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affected by the remarkable phenomenon of a sudden rush of waters. He was inclined to ascribe this to the action of a polar current encountering obstructions of the several groups, as he considered that no other cause would be so likely to produce such results. The sides of the islands which were most affected were those that would have been exposed to the full violence of a stream setting from a higher to a low latitude, while the action on the opposite side was either much diminished or wholly insensible.

no statement can embrace all the particulars, yet one or two instances of such deviation may be mentioned. Cruising to the southward of New Georgia and Bougainville Islands, throughout the S.E. monsoon, from May until October, in the years 1836 and 1840, the current ran strongly to the S.E. against a strong wind and heavy swell, although at the same time, on the North side of these islands, it was running strongly to the westward. Off the North side of New Ireland, where a westerly current prevails, changes to the eastward occur for ten or twelve days at all seasons."

Between September and March westerly winds are regular at the Solomon Islands, and, according to M. Dutaillis, after they have set in, a very strong current runs invariably to the E.N.E. or N.N.E. between this archipelago and those of Santa Cruz, Mendaña, &c., sometimes at the rate of 40 miles per day. Capt. Richardson, bound from Brisbane to China by way of Huon Islands and Santa Cruz Islands, has experienced this current repeatedly, and states that he has seen great trees drifting along to the eastward in about lat. 2° N., long. 165° E. He estimated the rate at 48 miles per day, and supposed the trees to come from the shores of New Guinea.

Captain Le Mignon, whose remarks have been given previously, found the current, in April, 1846, between Mitre Island and San Christoval to run at the rate of 24 or 25 miles a day to the *East*. To the South of the Solomon Islands they ran to the South 45 miles a day, and also 30 to 45 miles to the East. The weather, it should be stated, was very bad, and the winds violent and irregular.

D'Urville found the currents very violent in his approach to New Britain, and on the North side of New Guinea. To the N.E. of the eastern extremity of the Louisiade Archipelago they ran to the North 30 miles per day. Farther North, between this and St. George's Channel, between New Ireland and New Britain, he found it set 36 miles a day to the N.W. ¼ N., and near that strait he was set 60 miles to the *South*, and 30 miles to the West in two days.—D'Urville, vol. iv., pp. 487—524.

When he sailed along the North coast of New Guinea he found the current setting strongly to the westward, at one period, about long. 142° E., at the rate of 58 miles in 48 hours.—(Vol. iv., p. 557.)

In May, 1874, the current on the North coast of New Guinea, in lat. 132° E., was found setting to the northward by H.M.S. *Basilisk* at the rate of 4¾ miles an hour, for ten consecutive hours. Eastward of this position to Dampier Island and Astrolabe Bay, the current was found setting to the westward, at the rate of from 12 to 48 miles a day.

Between the Fiji Islands and the New Hebrides D'Urville found the current setting to the West 40 miles per day throughout his passage.

Between New Zealand and Tonga, Wilkes found the currents variable; their general effect was a drift of 108 miles, in a direction S. 88° W. On this route

he passed the Kermadec Islands, and through the latitudes where the southern polar streams appear to be lost.

5. THE EQUATORIAL COUNTER CURRENT.

In our general remarks on the winds, on pp. 1052—1053, it is said that in the aerial systems of the Pacific, as elsewhere, there was a space between the two great belts called the N.E. and S.E. trade winds, in which the wind was variable and light, and in which calms and rain prevailed. This zone of *variable* winds, as they are known, is affected, in its breadth and latitude, by the annual progress of the sun in the ecliptic.

In the current systems we have a precisely analogous phenomenon—that of a body of water moving with more or less regularity to the *eastward*, bounded to the North and South by currents moving in the opposite direction. This counter current has been traced, with considerable certainty, nearly across the entire breadth of the Pacific; and the ensuing extracts will explain its character. The first is the observation made by Capt. Lütke, in his traverse in the *Séniavine*.

After crossing the parallel of 30°, in long. 81°, we had for forty-eight hours, and during light winds and calms, a weak current between North and N.W.; and then for a fortnight, from lat. 28° S., and long. 116°, that is, for a space of 2,400 Italian miles, we scarcely felt any current at all. In the course of this fortnight the difference between the estimated longitude and that by the chronometer did not exceed 20′, and there was none in latitude.

Between lat. 10° and 2° S., there was for four days, during which the trade wind, without blowing strongly, was constant and equal, a tolerably strong westerly current, the mean velocity of which to the W. by N. was 17 miles in 24 hours.

In lat. 2° S. the trade wind left us, and the current shifted also to the East, then to the N.E., and again to S.E., but more to this last quarter as far as 8° or 10° North latitude, where the N.E. trade stopped it. The mean effect of this current was E. 6° S., 12¼ miles in 24 hours.

For the sixteen days that the current just spoken of lasted, there were but two which showed any exception, but to compensate they were very striking; this was between lat. 1° and 4° N., where the currents drifted us, in 48 hours, 75 miles directly to the N.W., in extremely light airs between East and S.E., and sometimes during almost an entire calm.

This easterly current could here be attributed to light, variable winds, coming from the western quarter, but the same thing occurred in the neighbourhood of the Caroline Islands, when the N.E. trade wind blew constantly, and sometimes with considerable strength. In approaching the Island of *Ualan* we found a S.E. current in lat. 8°, and long. 163° E. To the West of this meridian the

easterly current did not extend toward the North beyond the parallel of 7°, and toward the South, in general, beyond that of 5½°. Between these parallels, and as far as long. 152° E., in the course of more than three weeks (in January), we did not once have westerly currents, but always to the East, inclining to the South in the eastern moiety of this space, and more to the North in the western half. There was no exception to this order, except between the *Séniavine Islands*, where the neighbourhood of the coasts and the action of the tides might easily interrupt the regularity of the usual currents. Its mean effect, during these three weeks, was 8·3 miles in the 24 hours to the E. by N.

We had no sooner passed to the North of the parallel of 6½°, long. 152° E., than we got into a strong current to the West, which did not leave us afterwards. To the West of 152° E. we did not get but once to the South of the parallel of 7° (from the 9th to the 12th of April, in long. 144° E.), and we also found the current inclining to the East. To the South of the parallel of 5°, on the meridian of the Island of Ualan, the current bore chiefly to S.W., but then once, in lat. 3°, the current was to the East 18 miles in 24 hours.

A zone of easterly currents, between the constant westerly currents, as well in the western as in the eastern part of the Pacific, has also been noticed by other navigators. Captains Hunter and Wilson found it more to the South than we did, in the limits of the Caroline Archipelago; Captain Duperrey, between lat. 2° and 6° N., and 7° to 10° E. of Ualan, had currents to the S.E. and N.E., but, on approaching this last island, they were still more to the S.W.; again, between the Equator and 8½° N., and long. 148° E. and 137° E., he found them easterly. Admiral Krusenstern places the limits of this East current, meridionally, at the Equator, and the parallel of 6°; from our experience, these limits are 5° and 7°, although in long. 163° E. we had already met with them. Capt. Freycinet found strong East currents between the latitudes of 9° 20′ and 4° N., and long. 149° and 144° W. Capt. Beechey, in his route from the Society Isles to the Sandwich Isles, found between the Equator and 4° N., where he got into the N.E. trade wind, a N.N.E. current, the mean activity of which was 18 miles in 24 hours. Captain Wendt, in the Prussian merchant ship *Princesse Louise*, found in three different years, between the parallels of 6° 30′ N. and 10° 30′ N., and long. 125° and 131° W., currents from the N.E. quarter, of a velocity of from 17 to 25 miles. From all appearances, these easterly currents have some connection with each other; but we do not yet possess a sufficiently large number of facts from which to deduce a general view of the subject.

To the North of this eastern current, within the limits of the easterly winds, we always found a constant current to the West, inclining in some parts towards the North, in others to the South. Between the parallels of 7° and 9°, where we passed, at different times, more than a month, the currents constantly bore away between W.S.W. and W. by S. In the months of February and March, between long. 152° and 146°, their mean force was, in eleven days, 15 miles in

24 hours, to S. 83° W.; between long. 147° and 144°, in the same interval of time, 8 miles to S. 71° W. In November and December, between long. 156° and 140° in sixteen days, 14·4 miles in 24 hours, to S. 79° W. Farther on, towards the West, in our route to the China Sea, we experienced nearly the same currents, their direction and force being in general 16 miles in 24 hours, to S. 70° W.

To the North of lat. 9°, the currents inclined more to the West of North. In the eastern half of the Pacific (between long. 130° and 146°, from lat. 10° to 30°) we found their general direction to be N. 86° W., and their force 11·7 miles in 24 hours. In the western half, on our route to the island of *Guaham*, their general direction, in the interval of four days, was found to be N. 75° W., 22 miles in 24 hours; and on our return from the Caroline Archipelago, under the same apparent circumstances, and in the same interval, S. 49° W., 22 miles in 24 hours. In leaving the Carolines, in April, as far as lat. 22°, where the trade winds left us, from long. 143° to 139° E. we had constant westerly currents, the general action of which, in 10 days, was N. 52° W., 18·3 miles in 24 hours; and in returning from the North to this archipelago, in November, we had these N.W. currents for the greater part of the time, up to the period of our meeting with the trade winds, in lat. 26° (long. 199° to 204°); and we found their mean rate, in nine days, to be 14·7 miles in 24 hours, to N. 69° W. On the meridian of the Island of Ualan, on the contrary, as far as the parallel of 28°, also in November, the general direction of the current was S. 43° W., 11 miles in 24 hours.

We did not observe that the direction or strength of the trade winds determined the direction of the current to the North or South of West. These different inclinations occurred with winds perfectly the same; we must, therefore, rather seek the reason in some local circumstances, if they should not proceed from some general and permanent cause, and are not an accidental phenomenon, changing without order.

A correspondent of the Nautical Magazine (January, 1843, page 5), also speaks of this reverse current:—In July, 1833, on the Equator, in long. 175° E., a current of about 2 or 3 knots an hour ran to the eastward for fourteen or fifteen days, although the wind was then fresh from the eastward; and it was thought that such changes have generally occurred once a year, probably induced by a strong S.W. or westerly monsoon in North latitude, reaching at this time near the line. They are fitful changes, and not to be depended on, nor can their extent to the eastward be stated.

What is here stated respecting the S.W. wind extending so far to the northward is confirmatory of what is advanced by Capt. Cook, as given on p. 1091.

The current generally on the equator, or from 1° or 2° N. to about 3° S., according to the same observer, runs to the westward about 2 or 3 knots, taking its course from the wind. But from other remarks it seldom reaches such a velocity.

Capt. Wilkes says the current sets through the eastern range of the Fiji Islands to the N.E., as observed by the *Porpoise*, during her survey of that part of the group, and as shown by the manner in which the casks of the whale-ship *Shylock* wrecked on Turtle Island, were carried to Fulanga, where they were picked up. We also experienced the same current in the drift it caused on the first night of our arrival off these islands. A strong current also sets to the eastward, on the southern side of the Fiji Group. I felt convinced that the currents here arose from cold submarine streams as a cause, and my views were corroborated by the fact that the *Peacock*, on her voyage from Sydney to Tongatabu, had been affected by northerly currents.—(Vol. v., p. 475.)

Capt. Wilkes continues:—"On our route to the northward we crossed a stream setting to the westward, which extends as far West as the Kingsmill Group, between lat. 2° S. and 3° N., after leaving which we encountered another, setting with equal velocity to the *East*, between lat. 4° and 9° N. This last tropical counter current was traced by us between the same parallels nearly across the Pacific, from the long. of 170° E. to the long. of 138° W. We had no opportunity of ascertaining ourselves whether it exists to the westward of the Mulgrave Islands; but Horsburgh, and several other authorities, mention the prevalence of an easterly current as far to the West as the Sea of Celebes, and particularly in lat. 4° N."—(Vol. v., p. 476.)

At the Gilbert Archipelago, during violent gales from S.W., which prevail from October to April, trunks of large trees are thrown upon the West sides of the islands, together with large lumps of resin, similar to that found in the soil of New Zealand.

Capt. Bristow found the current strong from West to East at the Purdy Islets, in February and March, 1817.

In September, 1875, in H.M.S. *Challenger*, this current was found running to the eastward at an average rate of 30 miles per day, but in 7° N., long. 150° W., its force was 50 miles a day, and its temperature varied from 80° to 82°.

We shall conclude with these remarks by Admiral Krusenstern:—

"This current, bearing from West to East, forms to the North of the equator a zone which extends to the 6th degree of latitude, and the velocity of which is frequently 20 leagues in the twenty-four hours. Ships returning from China in the opposite season, that is, during the S.W. monsoon, and proceeding by the Pacific Ocean towards the Strait of Gamen, do not generally go farther toward the East than the Pelew Isles; but if they do not pay great attention to this current, they will usually be carried several degrees toward the East. The best means of avoiding this stream of current is to attempt to cross it as quickly as possible from North to South, because South of the equator the S.E. trade is met with, accompanied by a current bearing to the West, the rate of

which, near the coast of New Guinea, is from 15 to 40 miles in the twenty-four hours, in a West and W.N.W. direction.'

These observations will demonstrate that between lat. 4° and 10° N., which limits may be subject to some fluctuation, there is a current running to the eastward, or against the usual course of the inter-tropical winds and the drift of the ocean on either side of it, and extending from the western extremity of the Pacific as far as long. 115° W., and perhaps beyond this, if the Peruvian cold current should not extend beyond that latitude in this meridian.

"A more simple explanation of this counter-current may be found in the fact that the equatorial currents, as they flow on each side of the belt of calms, remove the water from the eastern and accumulate it at the western side of the basin, and that the counter-current tends to restore the equilibrium thus constantly disturbed."*

In the Nautical Magazine, April, 1880, pp. 276—286, is a letter from Capt. J. McKirdy, of the SS. *Peruvia*, detailing his experiences in several voyages between Honolulu and Callao, in the year 1878. In leaving Honolulu for the eastward he met with strong northerly and westerly currents, where he expected to have found the equatorial counter-current; by taking advantage of these, on his return voyage, he made several good runs of 314 to 332 miles per day. He concludes that the southerly current along the West coast of North America, when met by the Peruvian current, is forced to the westward, and meeting the counter-current turns away to the northward at a point varying with the strength of the latter, and then bears off to the westward again. Its approximate track, as given by Capt. McKirdy, is shown on the chart illustrating the currents, at the commencement of this work.

Capt. McKirdy states the colour of this current is of a deep blue colour, its temperature being about 78°, and that of the surrounding water of the North Pacific, which is of a beautiful bright blue colour, 2° higher; the cold Peruvian current is of a dark dirty green colour. He thinks its breadth, when it runs swiftly, is 80 or 100 miles, and great care is necessary, if taking advantage of it, not to run out of it. The thermometer will give the first warning of getting into or out of it.

6. THE AUSTRALIAN CURRENT.

In the northern part of the equatorial current in the North Pacific, it has been shown that when it reaches the neighbourhood of the continent West of the Marianas it turns to the northward and eastward, forming the well-defined Japanese current—the gulf-stream of the North Pacific.

We have a somewhat similar arrangement of current on the southern edge

* "Thalassa: An Essay on the Depth, Temperature, and Currents of the Ocean," 1877; by J. J. Wild, on the scientific staff of H.M.S. *Challenger*.

of the South equatorial stream, which, as has been previously stated, striking the coasts of New Caledonia, the New Hebrides, &c., trends away to the N.W.; so, in like manner, the portion South of this reaching the Australian coast, is deflected and runs to the southward, a warm stream, off the coast of Australia. This course it pursues until it encounters the cold antarctic drift to the N.E., which thus again deflects it and becomes incorporated with it. The first remarks bearing on this current we give from Admiral Krusenstern's treatise :—

Although the winds blow throughout the year either from S.E. or S.W., the current constantly runs to the South, with a velocity of 1 or 2 miles an hour, at the distance of from 4 to 20 leagues from land. Beyond these limits there is no current found, and very close to the land, particularly in the bays, we have a current to the North, but which does not exceed a quarter, or at most a mile, an hour. At the S.E. and southern part of Australia the current is very violent, and bears to the South, and near Cape Howe its direction draws more towards the East. In ranging along this part of the coast to go to the southward, it would be well to keep at the distance of 40 or 50 miles from land, because you will then be sufficiently far from the land not to fear the gales of wind from seaward which will be met with in the course of the current which runs to the South. On the contrary, if a vessel is making way for the North, she ought not to leave the coast more than 10 miles; but this navigation demands much caution, to guard against gales from seaward. The barometer will then be the best guide; the mercury rises on this part of the coast with S.E. winds, and falls with those from N.W.; N.E. or S.W. winds do not equally influence the barometer.

Lieut. Jeffries, R.N., who has navigated a great deal on the East coast of Australia, and filled up the blanks left by Cook and Flinders in the geography of this part of the globe, has made some observations on the currents in this neighbourhood which do not entirely accord with those of Capt. Flinders. According to Jeffries, the currents from lat. 28° to the southern part of Van Diemen's Land, during summer, that is, from August or September until April or May, run to S. by W. with a rate of $1\frac{1}{4}$ mile; always provided that the distance from the coast does not exceed 20 miles; if it is greater than this and as far as 60 miles off, they run to N. by W., with a rate of $3\frac{1}{4}$ miles an hour. In winter the opposite of what has just been stated takes place.

To the North of the tropic to the opening of Torres Strait, and within the coral banks, the Barrier Reefs, there is not any current, nor any ebbing or flowing to be observed. Outside the Barrier Reefs the currents are generally regulated by the prevailing winds.

Capt. Sir James Ross, immediately on coming out of the heads of Port Jackson, found the temperature of the air to rise from 55° to 60°, and the surface of the sea from 55° to 63°, a temperature it maintained during his progress to the eastward toward New Zealand. During the first twenty-four hours

they had run 150 miles, and were set 29 miles to the South of their reckoning. —August 5, 1841.

This belt does not exceed 300 miles in breadth; beyond, or to the East of which, the current sets to the northward 10 miles per day.

On March 3rd, the United States' ship *Peacock* left Sydney, and passed the heads of Port Jackson on the same afternoon. When about 70 miles from the coast, in lat. 33½° S., they experienced a change of 4° in the temperature of the sea; and on April 3rd they found they had been set 30 miles to the southward during the day. On the 5th, the temperature again fell to 72° with an easterly current. Several English vessels were seen cruising for whales, in lat. 28° S., long. 157° E. The winds continued contrary and light. On the 9th, in lat. 26° S., long. 159° E., an opportunity occurred for trying the deep sea temperature. At 830 fathoms below the surface, the temperature had decreased to 46°, that of the surface being 76°; and the current was found setting E. by S., half a mile per hour. The next day, in lat. 25° 40′ S., long. 160° E., the experiments were repeated; the surface water was 75°; at 100 fathoms, 73°; at 300 fathoms, 56°; and at 500 fathoms, 49°. The current was now found setting to the S.S.W., at the rate of half a mile per hour.

Capt. Wilkes, in his remarks on the currents, also has the following:—

Before making the coast of New South Wales, the temperature of the water rose to 73°, and on a subsequent occasion to 75°, and we experienced the effects of a stream that sets to the southward parallel to the coast of New South Wales. This current, like the Gulf Stream, is variable in breadth and strength, and at certain seasons of the year runs with great rapidity. The occurrence of this stream renders it advisable that vessels bound to Sydney should make their landfall to the northward of the harbour. There is no difficulty in tracing the connexion of this stream with that which we found setting to the S.W. near the Fiji Group, which being thrown towards the coast of New South Wales by the South Polar Stream that meets its course obliquely, it also receives an accession of strength from the waters that flow to the S.W. on the West side of New Guinea; ample proof of such a current is to be found in the difficulty of passing to the eastward of the Barrier Reefs. This stream is analogous to our Gulf Stream, although much less remarkable, and is at times found to extend to the South of Van Diemen's Land, the distance to which it prevails depending on the strength of the polar current which opposes it. Thus the French frigate *La Venus* met this stream to the South and East of Van Diemen's Land in the month of January, 1832, and was more than thirty-six hours in passing through it. It more frequently turns into Bass's Straits, after which it is lost in the sea to the West of Van Diemen's Land, or mingles with the polar current.

We shall conclude with a few remarks on the connecting currents which are found between Australia and New Zealand.

In other portions of the world recent experiments have shown that a system

of revolution is going on in the separate basins into which the ocean is divided; where the land bounds any expanse of water in several directions, the tides and currents circulate around its borders, leaving the central space comparatively or perfectly free from their action. This notion was perhaps first distinctly enunciated by Professor Whewell, as to the North Sea tides, and confirmed by Capt. Hewett.

In the space between Australia and New Zealand, the same operation is going on. To the westward is the southerly warm current just described. To the South this warm current is pressed upward by the northerly cold antarctic current. On the New Zealand coast this current is felt as far to the northward as Cook Strait, while to the northward of the islands the warm equatorial and the cool polar currents by turns gain ascendancy. This system developes one feature, that of a central space in which no current (except those dependent on the wind) is to be found. It is called by the whalemen the *middle ground*, and has been exceedingly productive to the New Zealand and Australian whale fishery. Its physical character we must suppose to be favourable to the production of the food of the whale, which perhaps flourishes here undisturbed by the transporting influence of currents unequalizing the temperature, and occasioning different water climates, so to speak, in the same locality. It is probable that the whales frequenting this middle ground come, or rather have come, to the shores of New Zealand, N.W. of Cook Strait, to calve in the bight called by the whalers Motherly Bay, However, it is most probable that the navigator, by availing himself of the various set of the currents, which will be elucidated by this theory, may greatly assist his passage across this part of the ocean.

We will cite some remarks that have been made on it.

Wilkes found, on approaching Lord Howe Island and Ball's Pyramid from the Samoan Islands, a current setting North, in which direction his drift in the passage was 120 miles. In the neighbourhood of the first-named island the temperature fell to 66°, but on nearing the coast of Australia, the warm southerly current raised it to 73°.

Capt. FitzRoy says :—On New Year's Day, while in sight of the islets called the Three Kings, we passed through several tide "races," one of which was rather "heavy," and would have been impassable for a boat. These races moved towards the North while we could trace their progress. The temperature of the water *fell* 6° after passing through the principal one. Next day at noon we found that during the past twenty-four hours we had been set as many miles southward (S.S.E.), and hence I am inclined to infer that we were influenced by regular tide streams, rather than by currents setting always in one direction. To the succeeding day at noon (3rd) we only set 7 miles by water, and that due East. Afterwards, in our passage to Port Jackson, we had alternately northerly and south-easterly currents of about 10 miles a day, and it was easy to tell which current we were in by the temperature of the

sea; while the stream set from the North the water thermometer showed about 72°; but when the current was running from the southward, the temperature of the ocean, a foot below as well as at the surface, was only 67°.

D'Urville considered that Cook Strait, the separation between the two larger islands, had been formed by the constant drift of the ocean to the S.E. (caused by the permanent S.W. winds) making a free passage through the group.

Though not immediately connected with the system just described, the following brief remarks may be given here respecting the currents around New Zealand. Wilkes considered that the antarctic drift strikes the southern part of the islands, and forms currents on either side of the range, which, however, are not constant. That branch which flows on the western side appeared to be the strongest, and is felt as far to the North as Cook Strait. The current which flows on the eastern side forms an eddy to the North of the islands.

Capt. Newby, sailing eastward from Cook Strait, in August, 1849, when on the meridian of the Chatham Islands, fell in with tangle and seaweed; this would indicate the northerly (polar) current before spoken of.

CHAPTER XXIII.

I.—TIDES, MAGNETISM, ICE.

1.—TIDES OF THE PACIFIC.

Except on the surrounding shores, where they exhibit similar phenomena and magnitude to other parts of the world, the tides of the Pacific are insignificant, and almost unnoticeable to the mariner. In the tables at the commencement of the present work, and in the description of the coasts and islands, are given the elements of the tides necessary to navigation; that is, the hour of high water, and the rise and fall of the tide. But in the vast space between the coasts of America, Australia, &c., the tidal wave is scarcely appreciable, except by refined observation, and can form but a small portion of the actuating consideration in navigation.

Under these circumstances we deem it unnecessary to enter into the general laws of the tides as founded by the illustrious Newton, or the interesting features elicited by the discussion of the late Rev. Professor Whewell and Sir John Lubbock. They can be referred to elsewhere, as in our North Atlantic Memoir, 1879, p. 290, *et seq.* And for those details, as applied to special localities, the reader will find them in the tables referred to, or in the pages of the work to which they appertain. The present consideration, therefore, will be confined to the general view of the South Pacific tides, as set forth by Dr. Whewell, to whom the main features of the tidal laws, as they are now known, is chiefly owing.

The Rev. W. Whewell on the Tides of the Pacific.

I shall not attempt to determine the general course of the tides in the Pacific, but will remark that the view now given of the distribution of the tides in an ocean explains several of the features of the Pacific tides, which were before very perplexing. If we suppose an ocean tide, from the borders of which proceed tides having their progress marked by cotidal lines, we can easily draw lines so as to include the following facts and observations :—

1. The *easterly* motion of the tide wave around Cape Horn, which is established by Capt. King's observations, and which is difficult to reconcile with the supposition of a tide revolving from West to East round the South Pole. This is explained by its being a tide proceeding from an oceanic tide.

2. The tide being at nearly the same hour along a large portion of the coast of South America, namely, from the Strait of Magalhaens for 20° or 30° northward. This shows that the cotidal line is nearly parallel with the shore.

3. The very small tides, or no tides, at the islands in the centre of the Pacific, Tahiti, and the Sandwich Islands. Those belong to a central portion of the ocean, where the rise and fall of the surface nearly vanishes.

There are two sources of inaccuracy in tide observations, namely, the want of a clear understanding as to the thing to be observed, and the irregularity and complexity of the facts themselves. There is probably still some unnecessary difficulty produced by regarding, as a cardinal point in observation, the "establishment" as vulgarly understood, namely, the hour of high water *on the day of new or full moon;* for, in fact, the hour of high water on this day is of no more importance than the hour of high water on any other day, except in so far as it gives the means of knowing the hour on other days. And it does not afford the means of doing this any more than the hour of high water for any other given age of the moon does. For just as much inaccuracy as, from whatever cause, there is in deducing the time of high water for all ages of the moon, from the time at a given age, just as much inaccuracy is there, from the same causes, in deducing the time of high water for all ages of the moon, from the time of full or new moon. If the tides are regular, and the observations good, the common "establishment" may be obtained from the observations of any one day; although, to give much value to this deduction, the tides should be observed for a fortnight. And if such observations be made for a number of very distant places, the common "establishment" does not represent a corresponding fact at different places. In some places it means the time of high water one day after the highest tide; in some, the tide two days after the highest tide; in some, three days; for the "age of the tide" is different at different places, and the tide which corresponds to the new or full moon comes after the new or full moon by one, two, or three days. Hence, in order that we might compare the tides of distant places by means of a fact which had the same meaning in all of them, I proposed, in a former essay, instead of taking the common establishment, to take what I then called the *corrected establishment*, namely, the *mean* of all the lunitidal intervals, that is, of the intervals by which the tide follows the moon's transit. In general the corrected establishment is about thirty minutes less than the common establishment. It has been used by Admiral Lütke, in his discussion of the tides of the Pacific. As the common establishment is still the one familiar to navigators, and as no material error will result from the use of it, I shall make it the basis of my remarks on the tides of the Pacific. It may be useful to bear in mind what I have said, that this establishment may be deduced from observations not made at the new or full moon.*

I shall now proceed to give the tide hours for the coasts of the Pacific, ac-

* I have here said that in cases where the tides follow the common laws we may deduce the time of high water on one day from the time on another; I might have said the same thing of the heights.

cording to the best accounts which I find, judging them in the manner I have described.

I have, in my first essay, shown that round Cape Horn the tide wave has an *easterly* motion. Thus, as I have there said, according to Capt. King, at Cape Pillar it is high water on the day of full and change, at 1^h; at York Minster, 5° long. to the East, it is at 3^h; at Cape Horn, 3° farther East, it is at $3\frac{1}{2}^h$; in Good Success Bay, in Strait Le Maire, the hour is 4^h; on the East side of Strait Le Maire it is 5^h. It appears also from Capt. King's observations (p. 17), that the tide travels in the same direction along the coast, that is, to the northward, on the eastern shore of Patagonia. This direction appears by Capt. FitzRoy's Tables, to continue as far northward as lat. 40°, the wave employing about twelve hours in travelling from lat. 50° to 40° S. Along this coast the tides are very large; at Gallegos River, in lat. 42°, they rise 46 ft. This circumstance might lead us to imagine that they are the result of accumulated waves converging from the North as well as the South; and this is probably the case. Yet it is remarkable, especially when considered in connexion with this view, that in the great estuary of the Plata there is no perceptible tide. I shall not, however, dwell at present upon the tides of the Atlantic, but shall proceed to those of the western coast of America.

West Coast of America (South).

	Lat. South.	Long. West.	Tide Hour.	Greenw. Time.	Rise	Authority.
	°	H. M.	H. M.	H. M.	FT.	
Cape Pillar.....	52 46	5 0	1 0	6 0	..	
Chiloe	41 52	4 57	11 30	5 0	6	King's Tables, p. 15.
,, ...	....	....	12 30	....	12	Heron, R.B.
Valdivia	39 50	4 56	11 30	3 26	..	Norie, Purdy.
,, ...	....	....	....	3 30	..	FitzRoy, p. 284.
Concepcion	36 49	4 53	10 0	2 53	..	Malaspina.
Valparaiso	33 2	4 45	9 25	2 10	..	Malaspina.
,, ...	....	....	9 40	....	4	Du Petit Thouars.
Coquimbo	29 54	4 45	9 20	2 5	..	Remark Books.
,, ...	....	....	....	2 0	..	FitzRoy, p. 285.
Iquique	20 0	....	....	1 30	..	,, ,,
Arica	18 28	4 40	....	....	..	,, ,,
Callao	12 4	5 7	6 15	....	..	Malaspina.
,, ...	....	....	6 0	11 7	$2\frac{1}{2}$	Du Petit Thouars.
Payta	5 3	5 24	3 18	....	6	,,
Guayaquil.						
Puna Island	3 27	5 19	5 0	....	12	Sir Edward Belcher.
Punta Piedra....	3 30	5 19	6 10	....	10	Kellett.
Galapagos.						
Charles Island ..	1 15	6 2	2 10	8 12	..	FitzRoy, p. 84.
Chatham Island..	1 0	5 54	3 30	....	..	Purdy, Eth. Mem.
Isle Charles	....	....	3 19	....	6	Du Petit Thouars.
	North.					
Cocos	5 34	5 15	2 10	7 35	..	Purdy, E.M., p.50, Vancouver.
,, ...	....	....	4 0	....	..	Purdy, E. M., p. 47, Colnett.
,, ...	....	....	....	8 0	..	FitzRoy, p. 285.
Panama	8 57	....	3 20	....	..	Lloyd, Phil. Trans., 1830.
Panama Bay	....	5 18	4 0	....	13	Kellett.
,, ...	....	....	3 36	8 54	15	Sir Edward Belcher.

Our next attempt must be to arrange the tides of the oceanic isles of the Pacific, taking, in the first place, those South of the Equator, omitting the remarks on the North Pacific.

ISLES OF THE PACIFIC (SOUTH).

	Lat. South.	Long. West.	Time. H. W.	Greenw. Time.	Rise	Authority.
	° ′	H. M.	H. M.	H. M.	FT.	
Easter Island....	27 9	7 20	2 0	9 20	..	Norie.
Gambier Group..	23 0	9 0	1 50	10 50	..	Beechey.
Lagoon Island ..	18 0	9 18	12 30	9 48	..	Cook, Phil. Trans., 1772.
„ „ ..	....	....	11 15	....	..	Lalande.
Marquesas.						
Resolution Bay..	9 53	9 20	5 7	2 27	6	Du Petit Thouars.
Low Archipelago.						
Bow Island	18 6	9 23	6 30	3 53	1	Belcher.
Tahiti	....	....	Anomalous.		..	„
Tonga Isles.						
Annamooka	20 15	11 40	6 0	6 20	..	
Eoa	....	11 40	7 0	7 20	..	
Tonga-Tabu	21 8	11 41	6 50	7 19	..	
Wallis Island....	13 26	11 44	5 0	4 44	..	Zebra, R. B.
Fiji Islands.						
Nukulau.....	18 9	12 6	8 30	8 36	5	Belcher, Diurn. inequalities.
Muthuata	....	....	5 30	....	6	Wilkes, U S. Ex., viii. p. 322.
Ovolau	....	....	6 10	....	..	
New Hebrides.						
Tanna, Port Resolution	19 32	12 41	5 45	6 26	..	Lalande.
New Caledonia ..	20 17	13 2	6 30	7 2	..	Norie.
Norfolk Island ..	29 0	12 48	7 45	8 33	..	„
New Zealand, Tolaga Bay	38 22	12 57	6 0	6 7	..	Cook.
New Ireland.						
Carteret's Harb.	4 39	13 50	Anomalous.		..	Belcher.

These observations appear to imply a general motion westward of the tide wave; but I conceive that they are much too far apart and too unconnected to justify me in drawing cotidal lines; besides which, the smallness of the tides in the central parts of the ocean makes the observations more than usually doubtful, and is accompanied by some circumstances inconsistent with the notion of a simple progressive wave as the representation of the tidal phenomena of those seas. I will consider those circumstances for a moment.

Tides of the Central Pacific.

The tides over a great portion of the central part of the Pacific are so small that we may consider the lunar tide as almost vanishing. Thus, at Bow Island, it is stated as only 1 foot; at Tahiti it is hardly more; at the Sandwich Islands it is 2 feet; and even at New Ireland, where we are no longer in the central

space, but among the larger islands to the West of it, the tide is only about 2 feet. But moreover, at some, at least, of these places, the tide, small as it is, is not the *lunar* tide following the usual laws. At Tahiti, for instance, the time of high water appears never to deviate from noon by more than a certain difference, although Sir E. Belcher has shown that it varies from 9 a.m. to 3 p.m.* At Bow Island there appears reason to believe that the limits are much the same; and perhaps at Carteret's Harbour, in New Ireland. Now it will be easily seen that such a result as this would follow if we were to suppose the tidal influence of the sun and of the moon to be equal. On this supposition it is plain that the high water would always occur halfway between the sun's transit and the moon's transit. Hence at new moon the high water would be at noon; as the moon went away to the eastward of the sun, the tide would be later and smaller, till, when the moon was six hours' distance from the sun, the tide would be at 3^h; but would in fact vanish. After this point the tide would reappear at 9^h a.m., or a little later, the inferior transit of the moon now taking the place of the superior one, in determining the tide; and from this time the tide would be gradually later and larger, till, at full moon, it would be again at noon, and so on. This appears to agree pretty well with the phenomena of the tides of Tahiti, as determined by Sir E. Belcher.

A more minute examination of the tides in these regions will enable us to pronounce more decidedly whether the law of the phenomena is that which has been just stated. And if it appears that the phenomena do follow this law, we shall have further to consider how such a motion of the sea in those parts is to be combined with the very different movements which occur in other places, and what is the general movement of the ocean which they indicate; whether, for instance, they are best explained by looking upon the lunar and solar parts of the tide, as produced by two separate waves, which may increase and diminish separately, and may start from different epochs in their motions. I shall not now pursue this point further; nor shall I further examine how far the phenomena approach to the cases of fluid motion already described, in which there is a marked wave at the outskirts of the mass, and an approximate quiescence of the surface in the central parts: namely, the case of a stationary undulation, and of a revolving undulation, or rather revolving cotidal line. I may remark, however, that the latter supposition, that of a revolving undulation, by which the tide is carried from California northwards along the American shore, and to the coast of Kamtschatka, while the cotidal lines converge to some central point in the North Pacific, would explain the smallness of the tides at the Sandwich Islands. When we proceed westward from the central parts of the South Pacific to New Zealand and Australia, we again find the feature which we have already noticed in the tides, namely, that the cotidal lines run nearly parallel with the shore in its neighbourhood, but that we cannot easily

* Philosophical Transactions, 1843, part I.

infer the oceanic from the littoral tides; for the tide lines of VI., VII., VIII., IX., X., XI., succeed each other along the coast of New Zealand, and apparently double round its northern and southern extremities, as we should expect from the laws of fluids. But yet the line of X. recurs again on the coast of Australia, and is succeeded by later hours as we proceed northward and southward from about lat. 30° S. Cotidal lines may be drawn to accommodate themselves to these data; but of these lines the parts which occupy the ocean between New Zealand and Australia must be very doubtful.

I have been favoured by Sir James Ross with about a month's observations of the tides in the Bay of Islands in New Zealand; but my means of tracing the progress of the tides along the coast of New Zealand still depend on Capt. Cook's statements. The longitude of New Zealand is so nearly 12^h, that the local tide hour may be considered as coincident with the Greenwich hour. At Tolaga Bay, near the most easterly point of these islands, the time is 6^h. In proceeding to Mercury Bay and the Bay of Islands, on the N.E. coast, it becomes $7^h\ 30^m$ and 8^h respectively; and in proceeding southward from Tolaga Bay we have also a retardation. At Queen Charlotte Sound, and Admiralty Sound in Cook Strait, which separates the two islands, it is $9^h\ 30^m$ and 10^h, the strait producing a considerable retardation. At Dusky Bay, the southern point of the island, the time is $10^h\ 57^m$.

(We omit here the remarks on the Australian tides.)

I have now put together all the principal materials which I have procured for determining the course of the tides in the Pacific. But it is apparent, from what has been said, that the materials are insufficient to give us any complete or consistent view of the tidal movements of the waters of the ocean and the neighbouring seas.

I may observe, moreover, that there appears to be little chance that our knowledge of these tides will be much increased by observations made in voyages principally directed to other objects. Although, in the surveying and exploring voyages since Capt. King's, many tide observations on the coasts, and at the islands of the Pacific, have been made, and many of them with care and skill, we have scarcely any material facts added to our knowledge; and the cotidal lines for the shores of America, New Zealand, and Australia, as I drew them in 1833, remain with scarcely any alteration. Cook's observations at New Zealand, for instance, are for this purpose better than any since made, because they are connected (being made by the same navigator, and in close succession), and extend along a continuous shore. It is only by observations thus connected, and having some degree of geographical continuity, that we can hope to trace the course of the tides.

2.—MAGNETISM.

As in the case of the tidal hours and range, so the amount of the variation of the compass on the South American coast is given in the tables of Geographical positions, &c., at the commencement of the volume. These, therefore, with the accompanying diagram, will be amply sufficient for the mariner to correct or check his course while in sight of land. But on the open sea this element can only be derived from direct observation, or, since so much investigation and large amount of data have been brought into the subject, it will be sufficient for many purposes, if the sailor, knowing his latitude and longitude, derives this important element in his reckoning from the charts of magnetic curves, which represent, generally with great accuracy, the variation of the compass at the present epoch.

The principal authority on this subject is the chart drawn up by Captain F. J. Evans, R.N., hydrographer to the Admiralty. This is the result of the discussion of an immense number of observations corrected for the numerous sources of error, which so often render the observations made on board ship so much at variance with the real variation. Since the vast increase of iron ships, and the use of iron in wooden ships, these errors and the liability to them have vastly increased, as is well known. The establishment, therefore, of these magnetic meridians is a most important boon to the sailor.

Another element of difference also is the secular change in the amount of the variation, which, differing greatly in amount and direction in different regions, requires all attention when charts of past date are used.

To place at one view the existing condition of the Magnetic Variation (or deviation) in the Pacific, the illustrative chart has been prepared for the epoch 1884, and on it is marked, in different places, the present rate of change, by means of which the chart may be made available for several years to come. It will be understood that the coloured line (isogonic lines) show that the amount of variation is the same all along its course. It will also be seen that the variation is *easterly* all over the Pacific, except in the neighbourhood and to the westward of Japan and China; and that over the whole of the Equatorial Pacific it does not vary half a point. This subject calls for no further remark here. Its details are given in many works now.

3.—ICE.

In a former part of this work, Chapter VIII., is given a brief account of the lands which encircle the South Pole, in such high latitudes, however, as to be of little interest to the navigator engaged on a mercantile voyage, except that it is the birth-place of those ices which embarrass the voyage between the great capes of the Pacific and Atlantic, which otherwise might be pursued much more free from apprehension.

R. H. Laurie 35. Minories, London.

A. Findlay fecit.

In this section of the subject it is proposed to treat with brevity also of the phenomena of those antarctic ices that are met with in high latitudes, their formation, and seasons of occurrence. In this we have rested on the works of Sir James Ross, with the remarks of Dr. R. M'Cormick, the naturalist who accompanied that expedition, the Narrative of the United States' Exploring Expedition, and the other authors previously quoted. These will give the rationale of their formation and drift.

For their period and locality we are indebted to a paper by Mr. J. T. Towson, so well known as the projector of the modern Australian voyage, read at Liverpool in November, 1857.

It may be inferred that the line of perpetual congelation exists in a lower latitude in some parts of the southern hemisphere than in others. The icy barrier retreats several degrees to the South of the antarctic circle, to the West of Cape Horn, while to the eastward it advances to the northward of that line, which is no doubt owing to the situation of the land. But the limited experience of the navigators who have penetrated to the land, would lead to the inference that the line of the icy barrier itself does not change much in its position. From the great quantities of ice drifting in all parts of the ocean, in high southern latitudes, it is probable that the formation of ice islands is much more rapid than is generally supposed.

The manner of their formation is easily explained. In the first place the ice seems to require a nucleus, whereon the fogs, snow, and rain, may congeal and accumulate: this the land affords. Accident then separates part of this mass from the land, when it drifts off and is broken into many pieces, and part of this may again join that which is in process of formation.

From the accumulation of snow, such a mass speedily assumes a flatter table-topped shape, gradually increasing in thickness and weight by the congelation of rain, snow, and fogs, which last have no small influence in contributing to the accumulation, as may be supposed, when a few hours suffices to give the rigging and spars of a ship a coating of ice a quarter of an inch thick. Thus masses of a thousand feet in thickness might require but a few years to form. When the icebergs are fully formed they have a tabular and stratified appearance, and are perfectly wall-sided, varying from 180 to 210 ft. in height. Sir James Ross followed the line of these enormous ice-cliffs for 450 miles and upwards, with one unvarying height and character, from which the calculation was made that the ice must be upwards of 1,000 ft. in thickness. In some places the United States' Expedition sailed, for more than 50 miles together, along a straight and perpendicular wall, from 150 to 200 ft. in height. This enormous envelope, constantly but gradually increasing in thickness by the deposition on its upper surface, slides down the declivities of the land it rests upon, as is inferred by the analogous process well observed in the northern regions, protruding its margin into the sea, when the stability of the mass and

its buoyancy in the sea become neutralized, and its margin then breaks off, or *calves*, as it is termed, forming those tremendous wall-sided, flat-topped bergs, so characteristic of the southern regions. These icebergs afloat are from a quarter of a mile to 5 miles in length.

But these appear insignificant when compared with a body of ice in the South Atlantic Ocean, reported to have been passed by twenty-one ships during the five months of December, 1854, and January, February, March, and April, 1855, floating from lat. 44° S., long. 28° W., to lat. 40° S., long. 20° W. This mass received the various denominations of an immense iceberg, an ice-island, "groote ijs-eiland," and a connected mass of icebergs. Its elevation in one case exceeded 300 ft.; but its horizontal dimensions were 60 miles by 40. It was of the form of a hook, the longer shank of which was 60 miles, the shorter 40 miles; and embayed between these mountains of ice was a space of water 40 miles across. The first account of it was received from the *Great Britain*, which, in December, 1854, was reported to have steamed 50 miles along the outer side of the longer shank. This longest range of ice then bore N.E. and S.W., the bay before alluded to being open to the N.E. Whilst in this position it exposed ships to but little danger, since the bay could only be entered on the opposite course to that of ships on their homeward passage from Australia. But during the next three months it swung round 90° to the left, and drifted E.N.E. about 100 miles, which brought it very near to the route of outward bound ships, with the bay open to their track. We can scarcely imagine any mass of ice in an equally dangerous form, and regret to add that one emigrant ship, the *Guiding Star*, was embayed and lost on it with all hands. The *Cambridge* and *Salem* were also embayed in March and April, 1855, but through the skill of their commanders they were extricated from the most perilous situation in which we can conceive a ship to be placed by ice in any form. Beyond doubt this was an extraordinary phenomenon, there being no record of any other mass of ice bearing even approximate horizontal proportions to those just described.

The foregoing extract upon this Atlantic ice field, from Mr. Towson's Paper, is given here as an example of what it is possible to encounter in the Pacific. The chief result of the enquiry was to demonstrate that the chief area in which the ice is met with, in the voyage round the Horn, was to the eastward and north-eastward of the Falklands, as high as lat. 40° on the meridian of 20° W., an evidence of the north-easterly set of the antarctic currents before mentioned.

The peculiar distinction of the tabular berg of the southern hemisphere, and the pinnacled and irregular bergs met with in the Arctic ices, is due to their origin. In the North they are formed on a limited space of land, chiefly Greenland, and here the land ice reaches the sea down narrow fiords in the form of glaciers, literally rivers of ice, whose outlet into the sea is constantly disrupted, and in the spring the masses drift southwards in every variety of size and figure, except the tabular.

In the South, on the contrary, the whole of the South Pole appears to be encircled with land covered with this tremendous icy mantle, without any inlet into its interior, as is the case with the Arctic regions, unless there should be such in the lands South of Cape Horn, and thus there is no influx of warmer water, which can penetrate into the rear of the icy barrier (as is the case in Baffin's Bay and around Spitzbergen) to dissolve and drift it out in a similar way. Therefore the only feasible theory is that the whole mass of ice is gradually protruding its margin into warmer latitudes, and is disrupted when it loses its equilibrium.

When first separated they are all flat-topped and nearly level, from 100 to 200 ft. above the sea, and probably 800 or 1,000 ft. beneath it. They begin to dissolve at the base, generally irregularly, and then become tilted or presenting a bluff end, with a sloping face in the opposite direction. This is varied in all conceivable manners.

The icebergs met during the cruise of H.M.S. *Challenger* in the Antarctic seas, were usually from a quarter to half a mile in diameter, and about 200 ft. high; the highest was about 248 ft. The largest berg was seen farthest South, in lat. 66° 40′; it was certainly 3 miles in length, and accompanied by several others nearly as long.

By the observations they can be but little changed by the melting process before they reach the parallel of 60°; and here the remarks of Captain Sir James Ross as to the zone of equal temperature (39·5°) become important, as it must be after approaching this in their northward course that the warmer surface waters act powerfully on their submerged bases. This question has, however, been previously considered (see pp. 1112-1113).

During their drift to the northward, on reaching lower latitudes, and as their distance from the land increases, they are found in all stages of decay; some forming obelisks, others towers and Gothic arches, and all more or less perforated; some exhibit lofty columns, with a natural bridge resting on them of a lightness and beauty inconceivable in any other material. Some apparently retain their original tabular form entire, until they reach a lower latitude, while others have entirely lost it, and have evidently upset or overturned. The sight of one of these immense masses upsetting is a truly grand but exceedingly dangerous spectacle to witness. The noise of the huge mass rending is as loud as thunder or volleys of artillery, and Captain Boulton, who witnessed one overturning, says, that as soon as the mist occasioned by its fall cleared away, the enormous body rose out of the water in a totally different shape, its original appearance having been very high and square, but was then fully twice its former length, besides being low and smooth.

Mr. Towson says:—Generally drift ice is not to be met with in the southern oceans at a lower latitude than 58°, and, in that region, only in Austral winter months, from April to September inclusive. In one region, to which I shall more particularly refer, it has been found as low as 55°, and in

some cases brash ice has been reported in lower latitudes. But in these last instances, from the numerous icebergs adjacent, and from the very irregular sizes and forms of the ice, I am inclined to believe that it consisted of the debris of icebergs, and was not brash ice properly so called.*

The one already alluded to as sighted by the *Lightning* on the 10th of September, 1856, in lat. 55° 33′ S., long. 140° W., was 420 ft., high; and one of our most celebrated and talented naval surveyors informed me that he had seen icebergs in southern regions 800 ft. high. The *General von Geen*, August 6th, 1840, passed an iceberg 1,000 ft. high. The *Agnesa*, on the 23rd March, 1855, passed an iceberg 960 ft. high, in lat. 53° 14′ S., long. 14° 41′ E.

There appears to be a great difference in the movements of these vast masses; in some years great numbers of them have floated North from the antarctic circle, and at times obstructed the navigation about the capes. The year 1832 was remarkable in this respect; many vessels bound round Cape Horn from the Pacific, were obliged to put back to Chile, in consequence of the dangers arising from ice; while, during the preceding and following years, little or none was seen. This would lead to the belief that great changes must take place in the higher latitudes, or the prevalence of some cause to detach the ice islands from the barrier in such great quantities as to cover almost the entire section of the ocean South of lat. 50°. Taking the early part of the (southern) spring at the time of separation, we are enabled to estimate the velocity with which they move, as they have been met with 600 or 700 miles from the barrier, from sixty to eighty days after that period.

Mr. Towson says:—In tracing this and other remarkable masses of ice, I have been able to determine the direction of their drift, and their rate of progress. With the exception of one locality, the course of an iceberg is E. by N., rate 10 miles per diem. The only exception is, after it has passed to the eastward of the Horn, when its course bends to the N.E., veering round to the East as it approaches the lat. of 40° S., on which parallel from the meridian of 25° W. to 15° W. its progress is scarcely 1 mile daily, in direction nearly East. This course is afterwards bent towards the South, crossing the meridian of Greenwich on the S.E. rhumb. I have been unable to determine whether it again changes its course to E. by N. or returns by a vortical current to the neighbourhood of the Horn. There are facts tending to support both of these hypotheses; but since near the meridian of Greenwich few ships go higher than lat. 50° S. we have not a sufficient number of observations to enable me to decide this question.

The season of 1839-40 was considered as an open one, from the large masses of ice that were met with in a low latitude, by vessels that arrived from Europe at Sydney; many of them were seen as low as 42° S.

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* The only report of an ice field in the southern hemisphere that I have received was that of one that was seen in the month of September, 1854, in lat. 58° S., long. 56° W.

The data for the actual drift, as ascertained by the American Expedition, will give an approximation to the velocity of their progress to lower latitudes. On their progress to the South, January 9th, 1840, the first iceberg was met with in lat. 61° 8′ S., long. 162° 32′ E. The *Peacock* was the first to return, and nearly upon the track by which the *Vincennes* had gone South; the last seen by her was in lat. 55° S. The *Vincennes*, on her return fifty days later, saw them in lat. 51° S.; the *Porpoise*, about the same time, in lat. 53° S. The observations in the *Vincennes* give the distance of 10° of latitude, or 600 miles, to be passed over in fifty days, or about half a mile per hour, or according to those in the *Peacock*, nearly three-fourths of a mile. Many icebergs were met in lat. 42° S. by outward-bound ships to Sydney, in the month of November, much worn in appearance, with lofty pinnacles, &c. These, no doubt, had been detached in a former season, and would be naturally early the next season, drifted by the easterly current as well as westerly wind, and would pursue the direction they give them. They would, therefore, be driven to the N.E. as far as the S.W. winds prevail; and when these veer to the westward, would receive an easterly direction. It is when these winds prevail that they are most frequently found by the outward-bound vessels—between the latitudes of 40° and 50° S.

From the consideration of these facts he collected, Mr. Towson draws the following practical conclusions:—

First. That the period comprising the months of November and December, 1854, and January, February, March, and April, 1855, was a most extraordinary season for icebergs. In every part of the southern hemisphere South of the fortieth parallel, the number of icebergs met with during these six months was beyond all recorded precedent We had during that period a far greater number reported than the total of every other season from the time of Captain Cook down to the present year. Whether such phenomena are periodical, or that of 1854-55 is an exceptional one, we cannot decide; but from the reports of those who have been engaged in the seal trade, we believe that for fifty years previously there had been no season bearing the least comparison with the one under consideration. It has been observed that meteorological circles exist in the southern hemisphere. If there exists a cycle in which such seasons return, the period must be secular. One individual cannot, therefore, determine this point. Under this impression I beg to record the result of my investigations, that they may subsequently be extended, as these enquiries require a period for their completion beyond that of the life of any individual.

Secondly. On the outward passage, from the meridian of the Cape of Good Hope to Australia, there is no parallel that possesses an immunity from icebergs. In one year the greatest number is met with on one parallel; in another year on a different one. We cannot regard it as a general rule in this region, that the average number is greater in the higher than in the lower

latitudes, till we attain the parallel of 52° S., above which the danger is considerably increased. In seasons when icebergs are numerous, no outward-bound ship has adopted a maximum latitude higher than 52° S., without meeting with a greater number than that sighted by those who have sailed on the lower parallels. We therefore recommend, on this ground, as well as others previously discussed, that 51° S. should be the maximum latitude in voyages to Australia.

Thirdly. That on the homeward passage to the meridian of 80° W., a greater number of icebergs are met with in the lower than in the higher latitudes. Thus, in November, 1854, the *Great Britain* passed two hundred and eighty icebergs, in latitude 56° S., between the meridians of 112° W. and 92° W., independently of numerous icebergs in other localities. On the other hand, the *Golden Era* passed these meridians at the extraordinary latitude of 63° S., without meeting with an iceberg. It was not until she arrived at 72° W. that any inconvenience was experienced from ice, when she was surrounded by pack ice, in which she narrowly escaped being wrecked. The isothermal line of latitude 51° S., and longitude 40° E., appears to pass through latitude 61° S. in longitude 140° W., consequently a much higher maximum latitude may be adopted for the homeward passage. But, from June to December inclusive, the parallel of 57° S. should be preferred, since in most cases those who have adopted the higher parallel have been either impeded or endangered by pack ice.

Fourthly. That by far the greatest number of icebergs is met with in the southern hemisphere during the six months of November, December, January, February, March, and April. I have not the record of a single iceberg having been sighted in the midwinter months of June and July, and they have been seldom reported in the months of May and August.

Fifthly. Eastward of the Horn there is a space bordering on both the outward and homeward track, which may be regarded as dangerous from ice.

(*Note.*—Respecting the conclusion above stated, that icebergs are not met with in *June* and *July*, we have had an important communication from Capt. Haltermann, a competent sailor and trustworthy man. He has commanded the Bremen ship *R. O. Wylie*, sailing under the Hawaiian flag, between Bremerhaven and Honolulu, and he affirms that he *regularly met with icebergs and ice-drifts in the months of June and July*, in his various passages across the South Pacific, and frequently they were in great numbers. Other commanders have also stated the same fact to Capt. Haltermann.—1870.)

As far, however, as the homeward passage is affected by the consideration of this locality, it tends only to confirm our previous convictions, and we have more abundant reasons than ever to impress on the mariner the propriety of sighting the Horn and the Falkland Islands on his homeward passage. He has every inducement to follow this track. It is favourable for making a short passage, and it will keep the ship clear from the only locality, adjacent either

to the passage out or home, in which real danger exists on account of the ice. I think great sacrifices should be made to follow this part of the route home rigidly, for I have not met with any very extraordinary voyage home made by a ship that has given to the Horn or Falkland Islands a wide berth. In all cases in which no danger has been experienced from ice, delays have been occasioned and the passage has been spoiled, nor have I a case on record in which any mariner, following this advice, has met with ice after arriving East of the meridian of 75° W.

And lastly. In all ships adopting the composite route to or from Australia, a good look out should be kept, and the changes of the thermometer should be carefully observed. Captain M'Donald, of the *James Baines*, met with a considerable number of icebergs in his late extraordinary passages, but he observes that these stray icebergs do not considerably increase the risk with a prudent and careful captain. He has only to notice his thermometer to be forewarned of the approaching danger. In one case he found that the thermometer fell 4° as he approached the ice, and 2° more as he got to leeward of the berg. Captain Newland, in the log of the *Champion of the Seas*, proves that the thermometer not only indicates the approach towards ice, but also the amount of ice we may expect to meet with. In lat. 58° 30′ S. he passed two icebergs, the temperature of the water being 44°, and that of the air 42°. Between 50° S. and 47° S. he passed thirty-nine icebergs, the thermometer then fell to 35° in water, and 36° in air. In this instance the temperature was 8° or 12° lower, although the ship had sailed about 10° nearer to the equator, at which point the mean temperature of neither the air nor water was sensibly affected when an iceberg was approached. It is probable that in this instance some meteorological change might have counterbalanced the effect of the proximity of ice. But, if otherwise, this single exception cannot prove that the thermometer may be neglected, but rather enforces the necessity of keeping a most careful look out at all times.

Mr. Towson, at the conclusion of his paper, gives a catalogue of all the observed occurrences of ice in the southern hemisphere. This was derived from the examination of 250 logs of Australian ships, of which 104 contained reports of ice; besides this, there were about 70 other records of ice derived from other sources. A large portion of these refer to the Southern Atlantic, in the dangerous region before alluded to, to the N.E. of Cape Horn and the Falklands. And another section is that met with between the meridians of the Cape of Good Hope and Australia. As far as they refer to the South Pacific, the following list is extracted from the catalogue, and is arranged in the order of time, or in the separate months. Their frequency will enable the navigator to estimate the chances of encountering them. They are mostly shown on the chart illustrative of the currents of the Pacific given on a previous page.

Date.	Lat. S.	Long. W.	Description.
August, 1854	56° 30′	60° 0′	Pack ice.
September, 1844	59 0	140 0 to 150 0	Numerous icebergs.
September, 1854	63 0 to 58 0	69 0 to 72 0	Pack ice.
September, 1854	58 0	56 0	An ice field.
September, 1856	55 33	140 0	An iceberg 420 ft. high.
September, 1857	59 0	61 20	Pack ice.
November, 1854	56 0	112 0 to 92 0	Two hundred and eighty icebergs.
November, 1854	61 0 to 58 0	65 0 to 61 0	Numerous icebergs.
November, 1854	58 0	59 0	Icebergs.
November, 1854	56 30	56 0	Icebergs.
December, 1854	62 0 to 53 0	80 0 to 82 0	Numerous icebergs.
March, 1855	59 0 to 58 0	132 0 to 128 0	Numerous icebergs.
March, 1855	58 0	118 0 to 136 0	Numerous icebergs.
March, 1855	62 0 to 58 0	60 0 to 67 50	Numerous icebergs.
March, 1855	58 30	63 10 to 65 0	Numerous icebergs.
April, 1853	51 0	131 0	A large iceberg.
April, 1853	53 0	120 0	Six icebergs.
April, 1855	57 0	101 0	Numerous icebergs.
April, 1855	58 0	88 0	Numerous icebergs.
April, 1855	57 0	88 0 to 79 0	Numerous icebergs.
June, 1853	60 0 to 57 0	141 0	Pack ice.

Having thus given some notion as to their general character and locality, we may conclude with some admonitions as to avoiding them in sailing where they may be supposed to exist.

The indications of an iceberg are:—1. A natural effulgence, or *ice-blink*, which frequently renders them visible at some distance, even in the darkest night. At a short distance this effulgence may appear like a white cloud, extending over, or nearly over, the vessel's masts.

2. A considerable decrease in the temperature of the water, as shown by the thermometer, in comparison with the heat of the adjacent sea, and with the air above. This is most important and unfailing.

3. The roaring of the sea at the base of a berg, which, except in a

paddle steamer with its paddles in action, may be heard by an attentive listener when afar off.

Capt. Weddell recommends that, with a free side-wind, an iceberg or ice island should be passed on the windward side; as by this means the loose ice, which always drifts farthest, is avoided. If the ship, too, be moving with some degree of rapidity, she can avoid these small pieces more readily, as she is then more obedient to her helm. The large islands are not the more dangerous to a ship in passing among them, as they can be more easily avoided; on the contrary, it is the small, broken, or detached pieces, level with the water's edge, which are the most mischievous; for, when the wind is high, it is almost impossible to distinguish them from the break of the sea, and yet these small pieces do as much injury to a vessel as large ones, by knocking a hole in her bottom.

Capt. Boulton says that dependence should not alone be placed on what is said to foretell the near approach of icebergs, viz., a white and luminous reflection in the atmosphere over them. This may sometimes occur; but, from strict observation, it is ascertained that it can be discovered only over those which are large and square-topped, besides being invariably covered with snow. The rugged icebergs, and those that have upset, never show themselves in that manner as far as observation enabled to decide. The safest and the best way to discover them is by keeping a good look-out; the eyes constantly tracing and retracing the dark line of the horizon, for ice will always make that part of the horizon, where it is, lighter. By adopting this method, they were never mistaken; whereas, if they had been looking aloft, they would have run on many; at the same time one individual should be more particularly appointed to look out for the small pieces.

There is one use in the floating ice; that which is clear and transparent, without flaws or enclosed apertures which will contain salt water, will afford the purest and most delicious water in nature, and is a ready means of adding to the ship's stores. On the flat bergs or field ice pools of this fresh water are sometimes found beneath a scum of ice, and the water will be found perfectly wholesome.

II.—DENSITY, TEMPERATURE, DEPTH, ETC., OF THE OCEAN.

The topics which will be briefly adverted to in this section, are rather subjects of interest to the general enquirer, than directly useful to the mariner in his vocation. They are much more fully discussed in the "North Atlantic Memoir," and the "South Atlantic Directory," to which the reader is referred. Further information will be found in the authorities mentioned there, and in the notes below.

1.—DENSITY.

In the Pacific Ocean the distribution of the surface salinity differs considerably from that in the Atlantic. In the Pacific only the southern concentration area is well marked; in the northern part of the ocean the variations in salinity are slight, and the mean saltness low. In no part of the North Pacific was the specific gravity observed above 1·0265, while in the southern part, in the region of the trade wind, it exceeds 1·0270, and the mean specific gravity is comparatively high. The maximum in the North Pacific is 1·02644 in lat. 30° 22′ N., and in the South it is 1·02719 in 19° S. near the Society Islands. The whole of the Southern Ocean, between 40° S. and the edge of the ice, appears to have a very uniform surface specific gravity of about 1·0250, that of the bottom water of the Pacific being from 1·0257 to 1·0259.*

2.—TEMPERATURE.

The whole mass of the water of the ocean may be considered as divided into two layers, the upper comparatively superficial and rapidly cooling from the surface downwards, the lower of incomparably greater amount, extending to the bed of the ocean, and of nearly the same temperature throughout. The bottom-water of the Pacific, like that of the Atlantic, is doubtless an extremely slow indraught from the Antarctic seas.†

From 40° N. to 40° S. (in the Pacific Ocean) the temperature of the 1,500-fathoms line remains the same (34° to 35° F.). Below that line the water is slightly colder in the South than in the North Pacific; while above that line, to the 200-fathoms line, the water is colder in the North than in the South

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* See a paper "On the Distribution of Salt in the Ocean," by J. Y. Buchanan, Chemist in the *Challenger* Expedition, printed in the "Proceedings of the Royal Geographical Society," vol. xxi., pp. 255—257, and in the Journal of the same Society, vol. xlvii., 1877, pp. 72—86.

† "Proceedings of the Royal Geographical Society," vol. xx., 1876, p. 410; see also lecture by Dr. Carpenter "On the Temperature of the Deep-Sea Bottom," in the "Proceedings of the Royal Geographical Society," vol. xxi., 1877, p. 314, &c.; and the Reports from the officers of the *Challenger* Expedition.

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Pacific. But though the bottom-water is colder in the South than in the North Pacific, yet from the much greater depth of the latter, the body of water there whose temperature is below 35°, is vastly greater than in the former, an excess averaging 750 fathoms. As in the Atlantic, so in the Pacific, we find that the water at the bottom in the western portion is colder than that of the eastern, which is caused by the revolution of the earth trending the northerly-flowing current to the westward.*

The highest surface temperature found in the Pacific Ocean, during the cruise of H.M.S. *Challenger*, was 84° in lat. 2° 33′ S., long. 144° 4′ E., off the North coast of New Guinea. This was on March 1st, 1875. The lowest surface temperature was 52·5°, on October 25th, 1875, in lat. 39° 16′ S., long. 124° 7′ W., nearly midway between New Zealand and the coast of Chile.

Further remarks on the temperature of various parts of the South Pacific Ocean will be found in the chapter relating to the Currents.

3.—DEPTH.

It is only within the last few years that any serious attempts have been made to explore the depths of the Pacific Ocean. Of the principal expeditions for this purpose may be mentioned those of the U. S. ships *Tuscarora* and *Alaska;* H.M. ships *Challenger* and *Alert*, and the steamer *Dacia;* and the German war-vessel *Gazelle.* But notwithstanding the numerous soundings taken from these vessels, before we can form an accurate idea of the conformation of the bed of the Pacific Ocean, many more observations are necessary.

Dr. Petermann has endeavoured by uniting all the available observations to form a chart of the bed of the Pacific, by which it would appear that it is divided into two regions by an arc of a great circle joining San Francisco and the East coast of New Zealand. The region East of this line seems to be moderately even, with depths of between 2,000 and 3,000 fathoms. The western region, on the contrary, has a number of deep depressions, and here a greater depth has been found than in any other part of the world.†

In the North Pacific the *Tuscarora* attained the greatest depth yet found, 4,655 fathoms, or over 5½ *statute miles*, in lat. 44° 55′ N., long. 152° 30′ E., to the S.E. of Urup Island, of the Kurile Islands. The greatest depth found by the *Challenger* was 4,575 fathoms, in lat. 11° 24′ N., long. 143° 16′ E., to the S.W. of the Mariana or Ladrone Islands; whereas the greatest depth found in the South Pacific was 2,750 fathoms, in lat 7° 25′ S., long. 152° 15′ W., to the S.E. of Starbuck and Malden Islands.

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* "Log Letters from the *Challenger*," by Lord George Campbell, 1876, pp. 395, &c. See also "Thalassa," by J. J. Wild, mentioned in the note on p. 1133.

† "L'Année Géographique," Paris, 1879, pp. 117—120; and Petermann's "Geographische Mittheilungen," Gotha, April, 1877.

From temperature observations on board H.M.S. *Challenger*, the space between the N.E. coast of Australia and New Caledonia, New Hebrides, Solomon Islands, and New Guinea, appears to be surrounded by a comparatively shallow bank, not exceeding 1,300 fathoms in depth, the temperature within this area at a depth of 2,650 fathoms being 35°, or the same as at a depth of 1,300 fathoms. Another similar area between New Guinea and the South part of Japan, appears to be surrounded by a bank of 1,500 fathoms.

Between the Sandwich Islands and Tahiti, and in a southerly direction from Tahiti to 40° S., Professor W. Thomson describes the bottom as consisting mainly of red clay, except around volcanic islands, where it is chiefly composed of volcanic débris and shore-mud. In nearly all the soundings manganese was found. In depths exceeding 2,000 fathoms, in other parts of the ocean, the bottom appeared to be principally red clay, and occasionally gray ooze.

The accompanying diagram is taken from Dr. Petermann's chart, previously mentioned, but it is necessarily very imperfect, from the comparatively small number of soundings taken in this vast area.

THE
SOUTH PACIFIC
OCEAN
AUSTRALIA
WESTERN AUSTRALIA
NORTH AUSTRALIA
SOUTH AUSTRALIA
QUEENSLAND
NEW SOUTH WALES
VICTORIA
TASMAN SEA
NEW ZEALAND
North Island
Chathan Is
Antipodes Is
Auckland Is
Campbell I.
Macquarie I.
Bounty Is
Dougherty I.
Maria Theresa I.
Equator
Tropic of Capricorn
PAPUA OR NEW GUINEA
CAROLINE ISLANDS
Marshall Islands
Solomon Islands
Phoenix Islands
Ellice Islands
Samoa or Navigator Is
Fiji Islands
Friendly Islands
LOW ARCHIPELAGO
Society Islds
Marquesas Islds
Gilbert Islds
Galapagos Islds
BORNEO
Celebes Sea
Sulu Sea
Java Sea
Flores Sea
Timor Sea
Arafura Sea
Gulf of Carpentaria
Arnhem Land
Barrier Reefs
Great Australian Bight
Spencer Gulf
Gulf St Vincent
Port Phillip B.
Botany B.
Moreton B.
Hervey Bay
Shark's B.
Nuyts Land
Endeavour Strait
Torres Str.
Bass Strait
Cook Str.
Foveaux Str.
Hauraki G.
Plenty B.
Hawke B.
Tasman B.
Cook Str.
Otago
Canterbury Plains
Middle Island
Stewart I.
Chatham Strait
Queen Charlotte Sound
Admiralty Islds
New Ireland
New Britain
Bougainville I.
Choiseul I.
Santa Cruz Islds
Vanikoro Islds
Banks Islds
New Hebrides
Espiritu Santo I.
Aneiteum
Tanna
Vate I.
Vitu Levu I.
Savage I.
Rotuma
Tongatabu
Eua I.
Savaii
Upolu
Boscawen I.
Rose I.
Swain's I.
Suwarrow I.
Bowditch I.
Penrhyn I.
Nassau I.
Palmerston I.
Manihiki
Rakahanga
Pukapuka
Danger Is
Gardner I.
Nanomea
Nukufetau
Nukulaelae
Niutao
Nukunono
Fakaofo
Atafu
Caroline I.
Flint I.
Vostok I.
Starbuck I.
Malden I.
Jarvis I.
Fanning I.
Christmas I.
Palmyra
New York I.
Howland I.
Baker I.
Phoenix I.
Enderbury I.
Hull I.
Sydney I.
Birnie I.
Gardner Pinnacles
Maro Reef
Necker I.
Nihoa I.
Lisianski I.
Pearl and Hermes Reef
Midway Islds
Ocean I.
Pleasant I.
Byron I.
Strong I.
Sonsorol Islds
Pelew Islds
Mariana Islds
Guam
Marcus I.
Wake I.
Minami-tori-shima
Ogasawara Gunto
Volcano Islds
Kazan Retto
Nanpo Shoto
Bonin Islds
Iwo Jima
Parece Vela
Daito
Okinawa
Amami-O-Shima
Tokara Gunto
Osumi Shoto
Kyushu
Shikoku
Honshu
Hokkaido
Kuril Is
Sakhalin
Japan
Yellow Sea
Korea
Formosa
Hainan
Luzon
Mindanao
Sulu Archipelago
Celebes
Halmahera
Ceram
Timor
Aru Is
Arafura Sea
Banda Sea
Molucca Sea
Gilolo
Waigiou
Salawati
Misool
Batanta
Vaigeo
Jobi I.
Dampier Archipelago
Barrow I.
Montebello Islds
Lacepede Islds
Ashmore Reefs
Cartier I.
Scott Reef
Browse I.
Adele I.
Bathurst I.
Melville I.
Groote Eylandt
Wellesley Islds
Sir Edward Pellew Group
Gulf of Carpentaria
Mornington I.
Sweers I.
Pentecost I.
Torres Islds
Banks I.
Hinchinbrook I.
Cape York Peninsula
Cape Melville
Princess Charlotte B.
Lizard I.
Cape Tribulation
Whitsunday I.
Cape Hillsborough
Cape Manifold
Port Curtis
Moreton I.
Fraser I.
Sandy Cape
Double Island Point
Cape Moreton
Point Lookout
Stradbroke I.
Byron B.
Cape Byron
Solitary Islds
Port Stephens
Broken B.
Port Hunter
Port Jackson
Botany B.
Port Hacking
Jervis B.
Shoalhaven R.
Twofold B.
Cape Howe
Gabo I.
Wilsons Promontory
Western Port
Port Phillip B.
Portland B.
Cape Otway
Port Fairy
Cape Bridgewater
Cape Nelson
Cape Northumberland
Port Macdonnell
Cape Jaffa
Kangaroo I.
Encounter B.
Port Lincoln
Spencer Gulf
Gulf St Vincent
Port Adelaide
Yorke Peninsula
Investigator Str.
Nuyts Archipelago
Streaky B.
Head of Bight
Eyre Peninsula
Great Australian Bight
Ceduna
Fowlers B.
Denial B.
Anxious B.
Thistle I.
Waterloo B.
Franklin Harbour
Port Augusta
Port Pirie
Port Broughton
Wallaroo
Port Vincent
Port Victor
Port Elliot
Encounter B.
Lacepede B.
Guichen B.
Rivoli B.
Beachport

CHAPTER XXIV.

PASSAGES.

There is one misfortune attendant on the advancement of science, that by following out to minute particulars each special branch of it, the mind is more or less diverted from the simple first principles. The whole tendency of modern research, so indefatigably carried on in the present day, is to multiply the facts attendant on any department of physics; so that, instead of the plain matter of fact which our forefathers were content only to know, we have now such a multitude of phenomena to deal with, that the real question of importance is often subsidiary, or lost sight of. Thus the variation of the compass, the range and hour of the tide, the direction of the progress of winds and currents, have been shown, by multiplied observation and discussion, to be, though more or less simple in the principles in which they originate, most complex in their action, and are very different matters to comprehend to what in olden times they were understood to be.

There is no department of practical science to which these remarks are more applicable than in that of navigating a ship. When the rude instruments, and the imperfect resources of the navigator in ancient times are considered, it is rather a matter of wonder that ships were conducted to distant countries at all. But yet a perusal of the accounts of the voyages, made with these means only, will soon convince us that passages were then made fully equal in rapidity to many now undertaken, and, of course, very much in advance of all that might be expected by judging from what knowledge they have left us. Perhaps it was the very imperfection of their means which led them to use diligence and forethought, which are now replaced by more scientific substitutes. One thing is certain, that the simplicity of the various branches of navigation, as then understood, allowed the mariner to comprehend them as a whole better than in the present day, when they are subdivided into such an infinity of minor details; and the great principles of the sphere were then better considered than now, when the universality of charts causes the surface of the earth to be rather viewed as a plane in hydrographical problems.

What we would wish these remarks to tend to is, that in former times a principle of navigation, that of sailing on a great circle, was better understood

and carried out than in the present day, when it has been revived as a NEW subject; and, as the Pacific Ocean is certainly the peculiar sphere for practically developing this principle, we will be the more diffuse on this point.

Very early in the days of navigation, prior to those transatlantic voyages which led to the discovery of America, and the sea voyage to India, the principles of the art of great circle sailing were understood and promulgated. Sebastian Cabot alludes to it in 1495, and it is more than probable that Columbus, Magalhaens, and all the first great navigators were familiar with the subject.* It must be remembered, that at this time the principles of longitude were not understood or defined, and the charts of the period were merely the result of measurements made by dead reckoning or estimation, a method not in disuse until more than a century later. Almost all the early works give instructions for making these "sea-cardes," as well as the rude astronomical instruments, "cross-staffes," "astrolabies," &c., which were then considered sufficient.

A most important epoch in the history of navigation now succeeds. Gerhard Mercator, in 1569, published a universal map constructed on the principle now known by his name. In this the meridians, as well as the latitude circles, are represented by parallel straight lines; and by augmenting both the latitude and longitude in the same proportion, the rhumbs, which in reality are curves or spirals, become represented on it by straight lines also. Mercator does not appear to have exactly comprehended the true principles of his projection. This was reserved for Edward Wright, an Englishman, who correctly described its nature in his work called "The Haven-finding Art, or the Way to find any Haven or Place at Sea, by the Latitude and Variation, 1599." Still there is no mention of longitude as an element of navigation; but this soon was understood, and consequently the simplicity of the sphere was lost sight of in the facilities given by Mercator's or Wright's projections, and the ascertaining of the approximate longitude, although the theory of great circle sailing is of very little use without longitude.

Without divesting the mind of the ideas implanted by the consideration of a

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* The first work, apparently, in which it is directly alluded to, is by Pedro Nunez, in 1537. Another is by Pedro de Medina, in 1545, in the Spanish language, but his system was erroneous, and was corrected by Martine Cortes (or Curtis), whose work, "The Arts of Navigation," was soon after, in 1561, translated into English by Richard Eden, and was long the text-book of British seamen. Numerous other works, in which it is distinctly and correctly described, afterwards appeared, as one by Michael Coignet, of Antwerp, in 1581; an excellent work by Roderick Zamarano, in 1585, &c. That by this time it was thoroughly recognized is evident by a work by John Davis, published in August, 1594, called "The Seaman's Secrets, wherein is Taught the *Three* Kinds of Sayling—Horizontall, Paradoxall, and *Sayling upon a Great Circle.*" It is also described in Richard Polter's "Pathway to Perfect Sayling," about the same time. After this it is found in most of the old works on navigation.

plane chart, it is somewhat difficult to comprehend the exact nature and practical application of the great circle. It is by this method only that a ship can be directed to her destination as "the crow flies," or as if it were in sight, and the deviation from the systems usually adopted for convenience, from the charts, is greater, according as the distance between the two points is greater. It is most readily comprehended by observing how a thread stretched tightly over an artificial globe cuts the meridians and parallels.

The shortest distance between two points on the surface of a sphere is a portion of an arc of a circle which cuts these two points, and would surround the sphere, having the same radius and centre as the sphere itself. The equator is such a *great circle*, thus named because it is the largest circle which can be drawn on the sphere. A meridian is also a great circle, and cuts the equator at right angles. The intersection of two or more of these meridians is at the North and South Poles, 90° of arc distant from the equator. By sailing exactly on the equator, or on a meridian, are the only directions in which we shall find the compass to maintain exactly the same direction throughout a passage which shall be the shortest distance between any two points on the earth's surface. In a direct track on any other circle than a meridian or the equator, or due East or West, or North or South, the true bearing of the track will *vary* with each change of place.

This apparent anomaly will be cleared up if we consider what is the real nature of the angle termed the bearing of one point from another, as indicated by the compass or other means. East and West are terms referring to the horizon of a place; but these are only relative to the direction of the true meridian, or the North and South line of such place, and the East and West line cuts this meridian at right angles. But meridians are not parallel on the earth's surface: they, though straight, meet at *different* angles at the poles. Therefore any *straight* line at right angles to one meridian will not, if continued, cut any other meridian at a right angle, because they are not parallel; but the angle will vary more or less from a right angle according to the distance these meridians are apart.

Now in Mercator's projection, and here is the difficulty, the meridians are all made parallel; consequently a straight line intersecting one meridian at any angle will, if continued, intersect any other meridian at precisely the same angle. The straight intersecting line, on the surface of the plane in Mercator's chart, represents a very different thing on the spherical surface of the earth.

But if at any other angle it becomes a rhumb line, and this line transferred to the spherical surface becomes a spiral, and continued infinitely would encircle the globe, gradually approaching the pole, which it never reaches. Mathematically this curve, the loxodromic curve as it is called by the old writers, is one of very great complexity, but its simplicity, as practically

applied to navigation, has caused it to supersede the apparently more difficult great circle problems.

A great circle may be defined as a circle which divides the earth into two hemispheres, using this last term without reference to its usual meaning, and necessarily may vary in inclination to every possible angle from the equator or any one meridian.

The equator, being a great circle, necessarily bisects every other great circle on the earth, whether at right angles to it, as the meridians, or at any inclination. A great circle, therefore, which is inclined to the equator, which must be the case with those which pass through two places, in different latitudes, passes through two points on the opposite sides of the sphere, in directly the opposite latitude and longitude, as it must be bisected by the equator. And there are two points also of more importance in the calculations, and these are the points where the circle attains the greatest amount of divergence from the equator, or the maximum latitude attained in each hemisphere. These two points are called the *vertices** of the great circle.

It follows that the arc of a great circle and the rhumb line differ most widely from each other in high latitudes, and between places nearly on the same parallels. In low latitudes the two curves nearly coincide. The difference, too, is not so great when the two places are on opposite sides of the equator, because the great circle and the rhumb line then intersect each other.

The ship, in sailing on a great circle, is always in a *higher latitude* than when sailing on a rhumb line; hence if both tracks coincide at their extremities, there must be a point in the great circle at which its distance from the rhumb line, measured on a meridian, is greater than anywhere else; this point is called by Lieutenant Raper the point of *maximum separation in latitude.* It is by means of this point, and the two extremities of the arc, that Lieutenant Raper proposes to lay down, roughly, the great circle course on a chart.

We cannot give here the working portion of the great circle problems: that must be left to books specially devoted to the subject.† It will be found on referring to them that the immense labour formerly attendant on the necessary calculations is greatly simplified and reduced; still much is to be desired before it can be brought to that necessary simplicity to enable the

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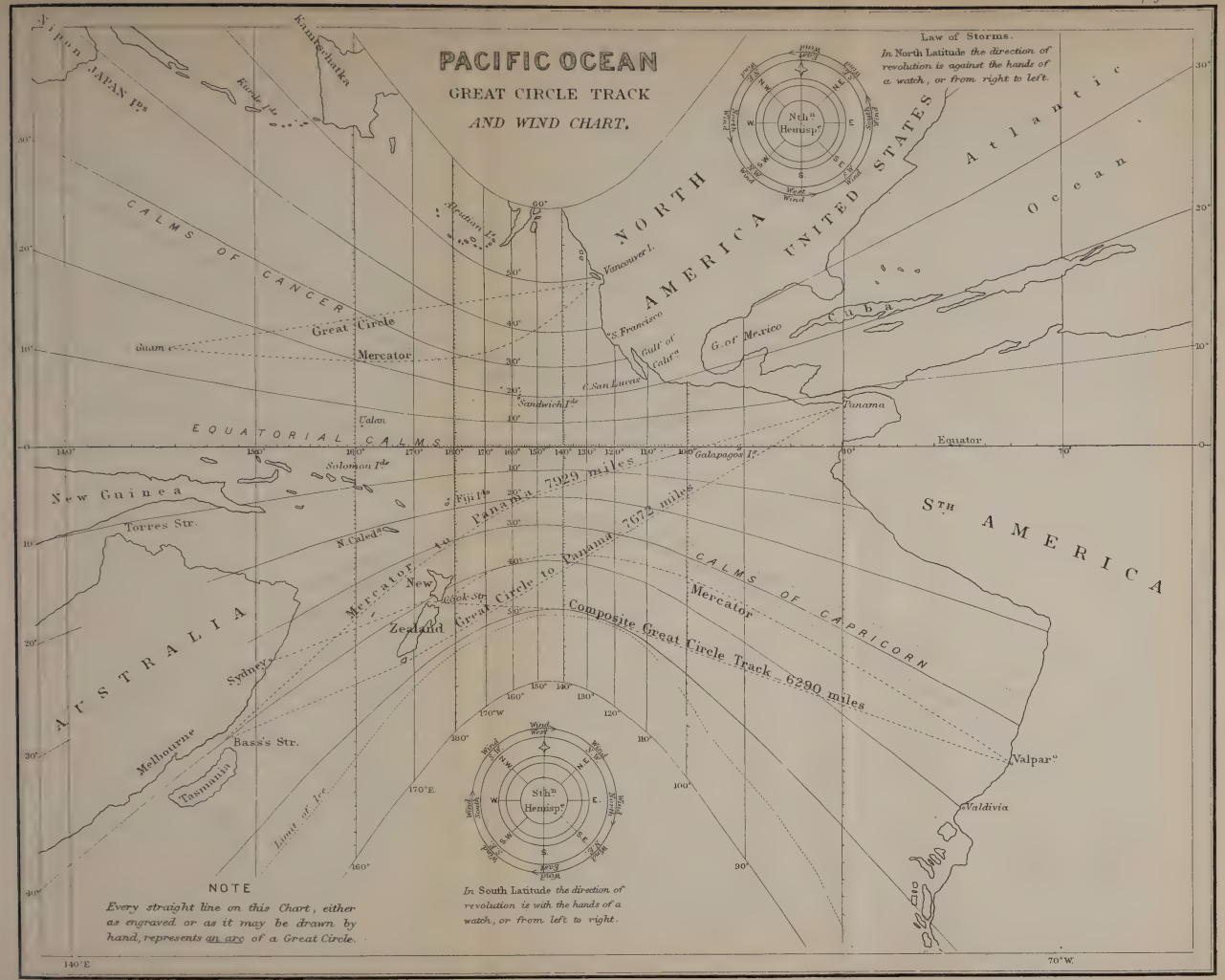
* The Hydrographic Office has published a useful set of tables for facilitating great circle sailing, by Mr. Towson. The construction of these are dependent on the latitude of this vertex, and the angular distance from its meridian, or that which bisects the circle at right angles, and, with the equator, divides it into four quadrants.

† See Raper's Navigation, Towson's Tables, &c. Capt. W. C. Bergen, of Sunderland, also publishes a useful set of Great Circle Charts for the various oceans.

Sir G. B. Airy has devised a method for laying off an arc of a great circle on Mercator's chart; it is given in the Nautical Magazine, April, 1884, pp. 280-281, contained in an article on Mercator's Chart, continued from the numbers for February and April, 1883.



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mariner to combine this system with the numerous other considerations which bind him.

There is one advantage in the great circle track, and it is no mean one. The great circle, apparently a circuitous route on the chart, represents a shorter distance than the straight rhumb line. Therefore if a ship be navigated anywhere between the great circle arc and the rhumb, she will still shorten her track. And further, if she assumes a course as much higher in latitude as the great circle course appears to be, she will still not have to sail over a greater space than the rhumb line. This consideration opens a wide field for choice as to a proper parallel to sail upon.

There are very considerable difficulties and apparent contradictions to the usually received notions, in judging as to the best course. A mathematical formula may present the exact directions and extent of an arc of a great circle; but another point arises in its practical application, that is, where does it lead throughout its course; into what latitudes, or into the neighbourhood of what islands or countries? And again, by assuming a course so very distinct from the rhumb course laid down on the Mercator chart, will it, by carrying the ship out of the trade winds or equatorial currents, or the reverse, neutralize or reverse the advantage which its shorter distance will give?

If the seaman, instead of using a plane chart, could use the terrestrial globe to guide his course, all difficulty would vanish, and the subject of great circle sailing would become clear to the mind of every one. It is its apparent anomaly with that of the Mercator's projection which constitutes all the difficulty.

For example:—From the entrance of the Strait of Juan de Fuca (latitude 48½° N., long. 124¾° W.), the commencement of the great circle course to Guam, in the Ladrone Islands (lat. 13½° N., long. 144¾° E.), is about *West*, but from Guam to the Strait of Juan de Fuca it is *N.E.*, and these ought to be the respective courses on starting from either position. By Mercator sailing the respective bearings are nearly W.S.W. and E.N.E., which courses, if maintained throughout the passage, will conduct a ship from one point to the other.

Again:—From a position 30 miles South of the Diego Ramirez Islands, to the entrance of Cook's Strait, in New Zealand, the great circle course touches the antarctic circle in about long. 117° W. Now it is manifest, upon reading the account of Cook's attempt to penetrate the icy barrier a few degrees to the eastward, in January, 1774, or the voyage of the *Tula*, Captain Biscoe, in January and February, 1832, that such a course, even in the height of summer, is altogether hazardous and unwarrantable, even if it be at all practicable. A greater difference of longitude than this of course increases the latitude to be attained on a great circle course; as, for example, the nearest course from Hobart around Cape Horn will reach lat. 75°, in long.

136° W., and this is above 8° to the southward of where Capt. Cook was able to penetrate in December, 1773.

It is in the Pacific Ocean, as we have before stated, more particularly, that the principal of sailing on a great circle may be fully carried out. The wide range of its longitudes, and the generally open character of the navigation in almost every portion, make it imperative, in shaping a course from one part of the ocean to another, to consider how far the shortest distance, or that on the arc of a great circle, may prove advantageous in making a passage: whether it will lead into dangerous latitudes, or into a system of adverse winds or currents. It has been the object of the previous pages to point out, imperfectly, it is true, what weather and current drifts may be anticipated; and by a combination of these circumstances, with the direction of the shortest route, the mariner must form his judgment as to the best track to be followed.

In coasting voyages the principle is entirely distinct from that of crossing the ocean. Here the course is governed by a variety of causes, which do not affect a ship in the open ocean. The land deflects the ordinary course of the wind, and the currents, too, assume fresh velocities and new directions: so that each particular locality requires a peculiar system by which the quickest and easiest passages may be made. Thus the navigation from one port to another on the West coast of South America would be attended with considerable difficulty, from the influence that the lofty Andes have in intercepting and modifying the usual trade and other winds, and the direction of the coast, which, offering a barrier in the South to the progress of the current drift, entirely alters its line of progress, if advantage were not taken of these variations from the usual law to expedite the vessel in her course.

In sailing over any considerable amount of longitude, but maintaining the *same* latitude, it is reasonable to suppose that something like uniformity in the direction of the wind will be found throughout the passage; therefore, the proper tracks for keeping the ship's head nearest to her destination are simple. But in latitudes at all removed from the Equator, and the arc of a great circle is assumed for the proper track, it necessarily follows that *different* latitudes must be entered, and consequently the above remark as to the steadiness of the wind no longer holds good.

But supposing it were possible for a sailing vessel to keep her head always on one course, there would be no difficulty in the matter. But this is known to be impracticable; and, even if it were so, it would not be at all advisable, since sometimes she would make greater progress by keeping away than by sailing close-hauled on the shorter route.

In beating, therefore, against any wind, however little it may drive a ship from her correct course, at each remove from her original track, a fresh one becomes necessary. It is, therefore, desirable that, at frequent intervals, the correct direction of the ship's destination should be ascertained, and the new course laid down. Thus the deviation from the shortest distance will be reduced to a minimum.

It has been considered that great circle sailing can only be generally useful to a steam-vessel, from her capability of maintaining her true course, and that a sailing-vessel contending with adverse winds can derive no advantage from following it. But to a sailing-vessel it is of very much greater importance than even to a steamer, because by disregarding the true direction, a vessel may choose that track which leads directly away from the nearest track.

The following example will explain this:—Suppose a vessel quitting the southern part of the North island of New Zealand, say Cape Palliser or Cook Strait, for Valdivia, in South America, with the wind at S. 84° E., and the ship can lay up 65° from the wind. The rhumb course is N. 90° E. The starboard tack is therefore 39° from the rhumb course, and the port tack 71°; consequently the ship, by Mercator's chart, looks best up to her port on the starboard tack. But the great circle course is S. 47° 51′ E., or only about 30° from the port tack, but 100° from the starboard tack. So that if the chart were the only guide, the starboard tack would be taken; but if the great circle course were taken, the *port* tack would be preferred, and thus after sailing on this tack 500 miles, she would be 456 miles nearer her port. But if the chart be taken as a guide, and the starboard tack run on for 500 miles, the ship would be *four miles farther* from her port than when she started.

This is an extreme case as far as navigation is concerned, but it is quite sufficient to demonstrate the point, that a ship following the apparent nearest course by the rhumb and the chart may follow a most circuitous route, and this will be much increased by sailing against the wind. For if a vessel can be kept within 6 points of the wind, she only nears her port 38 miles in every 100 she runs; but if she vary from this only half a point, as is very easily and unwittingly done from unperceived causes, as previously explained, she may only shorten her distance 29 miles in the same run. If a ship could only keep within 7 points, and when she is heavily laden, or in stormy weather, she cannot do more, the advantage would be doubled. Thus, great circle sailing is most valuable to sailing vessels under an adverse wind, tenfold that to which a steamer would derive from it, and by applying its principles to the working a passage, the advantage it has over rhumb sailing is fivefold in the Atlantic, and twelve times as great in the Pacific.

In the ensuing directions and remarks on passages, derived from various sources, we shall follow the order in which the work itself is arranged; premising that, in too many instances, the information here set forth is but incomplete and unsatisfactory. But this is the less to be regretted, as the general nature of Pacific navigation is of a simple character, and is not so embarrassed by the various current drifts and the direction of the wind systems as it is in the Atlantic Ocean, where the trend of the coasts and the predominating courses of vessels lie more in the direction of the meridian, and consequently cross these zones of wind and ocean currents.

THE PASSAGE ROUND CAPE HORN.

To all the older navigators the passage round Cape Horn had peculiar terrors; the dreadful account of the sufferings of Anson's crew, and the imperfect acquaintance then attainable of the nature of the iron-bound and inclement coast, invested this voyage with so much undefined apprehension, that its safe accomplishment was considered to be the greatest problem in navigation. Now, however, we have nearly perfect charts and descriptions of every feature of the South extremity of America, and thus one cause of anxiety and doubt is removed. The multiplied experience, too, of the numerous scientific voyages which have been made round the cape have instructed us what weather and difficulties are to be encountered, so that the passage may now be undertaken with as little apprehension as almost any other; although all the misfortunes which the old voyagers encountered may be again realized if the necessary precaution be not used, and advantage taken of what modern experience has demonstrated to be necessary for the safety of the ship.

In the first Chapter of this work we have given the description of the coasts and islands, with the necessary directions for the anchorages, which may be passed or used according to circumstances, and here we give the general directions for sailing around the cape as derived from various navigators, which instructions must be taken in connection with what is related in those pages.

The first remarks we shall quote are those which are entitled to the first place and consideration—those by Captain P. P. King, R.N., whose description of the coasts he surveyed is principally that recited in the former part of this work.

Captain King says:—Ships bound from the Atlantic to any of the ports in the Pacific will find it advantageous to keep within 100 miles of the coast of eastern Patagonia, as well to avoid the heavy sea that is raised by the westerly gales which prevail to the eastward, and increase in strength according to the distance from the land, as to profit by the variableness of the wind when fixed in the western board. Near the coast, from April to September, when the sun has North declination, the winds prevail more from the W.N.W. to N.N.W. than from any other quarter. Easterly gales are of very rare occurrence, but even when they do blow, the direction being obliquely upon the coast, I do not consider it at all hazardous to keep the land on board. In the opposite season, when the sun has South declination, the winds will incline from the southward of West, and frequently blow hard; but, as the coast is a weather shore, the sea goes down immediately after the gale. In this season, although the winds are generally against a ship's making quick progress, yet as they seldom remain fixed in one point, and frequently shift backward and forward 6 or 8 points in as many hours, advantage may be taken of the change, so as to keep close in with the coast.

Having once made the land, which should be done to the southward of Cape Blanco, it will be beneficial to keep it topping on the horizon, until the entrance of the Strait of Magalhaens be passed.

With respect to this part of the voyage, whether to pass through Strait Le Maire or round Staten Island, much difference of opinion exists. Prudence, I think, suggests the latter; yet I should very reluctantly give up the opportunity that might offer of clearing the strait, and therefore of being so much more to windward. With a southerly wind it would not be advisable to attempt the strait; for, with a weather tide, the sea runs very strong and deep, and might severely injure and endanger the safety of a small vessel, and to a large one do much damage. In calm weather it would be still more imprudent (unless the western side of the strait can be reached, where a ship might anchor), on account of the tides setting over to the Staten Island side; where, if it becomes necessary to anchor, it would necessarily be in very deep water, and close to the land. With a northerly wind the route seems not only practicable, but very advantageous, and it would require some resolution to give up the opportunity so invitingly offered. I doubt whether northerly winds, unless they are very strong, blow through the strait—if not, a ship is drifted over to the eastern shores, where, from the force of the tides, she must be quite unmanageable.

Capt. FitzRoy, whose authority, from his experience, must be very good, seems to think there is neither difficulty nor risk in passing the strait. The only danger that does exist, and that may be an imaginary one, is the failure of the wind. Ships passing through it from the South are not so liable to the failure of the south-westerly wind, unless it be light, and then it will probably be from the N.W., at the northern end of the strait.

After passing Staten Island, if the wind be westerly, the ship should be kept upon the starboard tack, unless it veers to the southward of S.S.W., until she reaches the latitude of 60° S., and then upon that tack upon which most westing may be made. In this parallel, however, the wind is thought to prevail more from the eastward than any other quarter. Never having passed round Cape Horn in the summer season, I may not perhaps be justified in opposing my opinion to that of others, who, having tried both seasons, give the preference to the summer months. The advantage of long days is certainly very great, but from my experience of the winds and weather during these opposite seasons at Port Famine, I preferred the winter passage, and in our subsequent experience of it, found no reason to alter my opinion. Easterly and northerly winds prevail in the winter off the cape, whilst southerly and westerly winds are constant during the summer months; and not only are the winds more favourable in the winter, but they are moderate in comparison to the fury of the summer gales (see pages 51 and 55).

Having passed the meridian of Cape Pillar, it will yet be advisable to take every opportunity of making westing in preference to northing until reaching

the meridian of 82° or 84°, which will enable a ship to steer through the north-westerly winds that prevail between the parallels of 50° and 54°.

The following is a quotation from the log of the *Florence Nightingale*, Capt. James Gales (one of the best and most experienced observers for the Meteorological Department).

He says:—" When bound to the westward round Cape Horn, I would always endeavour to go through the Le Maire Straits, and shave the cape itself as closely as possible; then pointing to the westerly gales that almost always prevail there, say, there is the enemy, lick him if you can, and if you cannot, stand away South, and turn his flanks. Gale succeeds gale very frequently off the cape, with such short intervals between, and those usually calm, that it is impossible to make headway; under these circumstances I would let the ship go away South, even if I made easting, and generally after reaching the latitude of 60° or 62°, East and N.E. winds will be found to prevail, whilst westerly gales are still raging near the land. This was Capt. FitzRoy's experience, and I will bring one instance forward to strengthen it.

" In December, 1853, I left Liverpool in company with the *Bergmann*, both bound to Valparaiso; he had rather the advantage of us in sailing, but we kept singularly close, and passed St. John's Cape, Staten Island, on the same day, he taking the lead by about 3 hours. We then met with strong gales blowing from West with southing in them; he kept tacking inshore, and I stood right away southward, although making easting, and reached my port nine days before him, even though after passing the cape he had a much quicker run along the coast than I had. I was in Valparaiso whilst he was still buffeting with Cape Horn gales. On referring to his log, I found that one day while we made 5 degrees of westing with East and N.E. winds, in lat. 61° S., he was drifting to the eastward with a gale at N.W. Supposing, as I sometimes do, that these westerly gales are parts of small cyclones sweeping round the cape, the East and more variable winds found farther South are easily accounted for."

Captain Maury cites the following from Captain Bailey, of the U.S. ship *St. Mary's*, which appears to convey the result of many conflicting opinions. I wish to call your attention to the barometrical indications South of Staten Land and Tierra del Fuego, and to the regularity and certainty with which the mercury falls with a northerly wind, and rises with a southerly. At this season —the summer— an easterly wind is rare, and, if it occurs, is of short duration. We found none. The North or N.W. winds are usually accompanied by cloudy, rainy, or misty weather; soon after it sets in, the mercury begins to fall, and continues to do so as long as the wind has northing in it, when there is usually an interval of calm, or light variable winds, lasting 2 or 3 hours; after which it veers to the southward and south-westward, squally, precipitating the mists in the form of hail and sleet, and exposing (at the S.W.) clouds of the cumulus character. At this point the mercury begins to rise, and continues ascending

so long as the wind has southing in it. A low barometer (say 28·50) will thus react with a southerly wind, and a high barometer (say 29·90) with a northerly.

This has been my experience after three passages around Cape Horn, in which my attention has been directed to these phenomena. And I am so fully convinced of the truth of my experience, that I would advise ships (after passing the Strait of Le Maire, which is free from all danger, saving thereby at least one degree of westing), having a northerly wind and a falling barometer, to stand on a wind to the southward, confident of the wind's direction, so long as the mercury tends to fall. If it reaches a minimum somewhat below 29 inches, and a calm ensues, equally to be certain of a "south-wester," and to be in a position, if possible, to profit by it.

Maury infers that the mean height of the barometer off Cape Horn is 0·8 inch less than it is in the trade winds.

To the remarks of Capt. King may be added those of his coadjutor, Capt. FitzRoy. At the commencement of Chapter II. (pages 49—53), we have given some general remarks by the latter on the outer coast of Tierra del Fuego, and the ensuing may here be included.

Capt. FitzRoy says:—In going westward, Capt. King recommends keeping near the eastern coast of Patagonia, and after passing Staten Island, if the wind be westerly, the ship should be kept upon the starboard tack, unless it veers to the southward of S.S.W., until she reaches the latitude of 60° S.

I do not think keeping near the eastern coast of Patagonia of importance to a large or strong vessel; smoother water is found near that coast, it is true, but currents set to the northward along shore more strongly than in the open sea. Icebergs, however, are never found in sight of that land, though they have been met farther eastward, to the North of 40° S. lat. Instead of going into 60° S. lat., I should prefer working to windward, near the shore of Tierra del Fuego, through Nassau Bay, where anchorages are numerous and easy of access.

In Orange Bay, or farther South, a ship may await a favourable time for making a long stretch to the westward; if foiled in one effort she may return, or seek for anchorage under Noir Island, in Euston Bay, or elsewhere, until a better opportunity occurs. To make westing ought to be the principal object, in my humble opinion, till the meridian of about 82°* is reached. Icebergs are not found near the land of Tierra del Fuego, but they are frequently met with at a distance from it. By adopting this plan of passing through Nassau Bay, or near Cape Horn, much labour and damage may be avoided, because a ship may lie quietly at anchor during the worst weather, and be ready to profit by any advantageous change.

Seasons.—A considerable difference of opinion prevails as to the fittest time

* Eighty degrees will be far enough West for a fast-sailing ship; but 85° will not be too westerly for a dull sailer.

of the year for making a passage round Cape Horn from the eastward. There seems good reason to believe, that in winter, when the sun is to the northward of the Equator, the chance of easterly winds is the greatest; and many persons are of opinion, that the westerly gales are then neither so violent nor so lasting as during the months that the sun is to the southward of the Equator. Admitting these circumstances to be as stated, there remain two very serious objections to the winter season; first, the length of the nights; and, secondly, the presence of ice islands. In a tempestuous and frigid latitude, the absence of daylight always augments, in a very serious degree, the difficulties of navigation; but when the formidable danger of icebergs is added, there can be little further question, I think, as to which season is preferable. All accounts seem to agree that it is during the winter and spring months, July, August, and September, that the ice is most generally met with; and as the masses in which it floats about are sometimes only a few feet above the water, and such as cannot possibly be distinguished at night, the risk which ships run in the winter months is very great. Sometimes it is met with in fields, which embarrass ships exceedingly; and since the opening of commerce with the shores of the Pacific has multiplied the number of vessels navigating these seas, many accidents occur every season. It will be seen that on our return we met the ice both in large and small islands in August, 1822; and several ships returned to Rio about the same time, after running against the ice, dismasting themselves, and sustaining other damage.

There are few things in navigation more dangerous than one of these low ice islands in a dark night, when blowing hard, and with a high sea; all circumstances which unfortunately are likely enough to come together at this particular season, when the ice is most frequently observed to be floating about off Cape Horn. In bad wheather it might be prudent to lie-to; but in fine weather, although dark, as it was with us, a leisurely course may be followed, provided uncommon vigilance be used. On this occasion I thought of a precaution, which it may perhaps be worth while stating. Having reefed the courses, that the officer of the watch might have a free view, the yards were braced sharp up, bowlines hauled, and everything prepared for tacking, and always kept so at night, from whatever direction the wind might blow. On an ice island been seen ahead, and near us, in the case of the ship being by the wind, the helm being put down, she would readily come about; if off the wind, she would come-to, with the sails so trimmed as to allow her sailing past the danger; or if this could not be, still she would be more ready to come about, and certainly be more manageable, in all respects, than if the yards had been in any other position.

Capt. James Weddell, a master in the British Royal Navy, has given some excellent observations on the passage round Cape Horn. These remarks are not the result of the single voyage which his book records, but the experience of five years' navigation in those seas; "and having performed a passage of

26° of longitude direct to the westward, about the parallel of Cape Horn, during the stormy month of April, I am fully acquainted with the perils and the inconveniences of this navigation, and can offer my experience with the confident expectation of its being found useful." The following are his observations on the navigation round Cape Horn, &c. :—

Many commanders of ships, who have been successful in making a passage round Cape Horn to the westward, have treated with unmerited derision the accounts given by Commodore Anson of this navigation.

I am quite satisfied, from my own experience, that the month of *March* might be productive of all the distresses described by the journalist. Capt. Porter, who passed the cape in the American frigate *Essex*, in March, 1814, says :—" Indeed our sufferings, short as has been our passage, have been so great, that I would advise those bound to the Pacific never to attempt the passage of Cape Horn, if they can get there by any other route."

The difficulty, however, in making this passage, is removed by choosing the proper seasons, which, when attended to, must at least save much time and wear and tear of the ship. In the beginning of November the winds begin to draw from the northward, and continue to be frequent until about the middle of February, when they shift into the S.W. quarter ; during these months the westerly winds are not lasting, hence the passage may be easily effected. From about the 20th of February to the middle of May, the winds are generally between S.W. and N.W., and blow with great violence. During this interval no ship need expect to make a passage round the cape that is not well equipped in every respect. From the middle of May to the end of June the winds prevail from the eastward, with fine weather. During these six weeks a vessel may round the cape, in sight of the Diego Ramirez. In July, August, September, and October, the winds prevail again between S.W. and N.W. ; but August and September are more particularly tempestuous. In regard to the route which ships should take round the cape, much depends on the season of the year, as relates to the force of the prevailing westerly winds. I prefer at all times passing to the westward of the Falkland Islands ; and in the summer season to pass through Strait Le Maire, as it saves 59 or 60 miles of westing, and can be attended with no risk if you have sufficient daylight to see to run back through the straits, in the event of being caught with a southerly gale at the southern entrance.

Cape Horn lies from Cape Good Success S.W. by S. $\frac{3}{4}$ S., distant 92 miles. Outside this line lie Barnevelt's Islands. If intending to touch at an anchorage about Cape Horn, a S. by W. course through the night will but well avoid the indraught which sometimes sets to the N.W. among the islands at the entrance to the Nassau Channel ; if not intending to go into harbour, a South course from Strait Le Maire to the South of Cape Horn, edging to the westward, and passing Diego Ramirez on the South side, at the distance of a

few miles, is the most advisable track. Ships working to the westward off the cape in the summer season, should stand towards the shore of Tierra del Fuego in the evening, when the wind will be often found to draw from the northward off the land, and westerly again in the morning.

These observations refer to the seasons I have recommended for passing the cape; but during those months which are attended with the most violent gales, viz., March, August, and September, I have only to recommend the advice given by Commodore Anson, that of standing to the southward into the latitude of 60°, where the sea is more regular, and the winds more equal. If, however, a ship be making a coasting passage, and should require to anchor, the following instructions may be found useful. The prominent situation of Cape Horn at once points out the neighbouring bay of St. Francis, in which are two harbours, perfectly safe for vessels of any draught of water. Their approach is so easy as to make it necessary only to remark, that Wigwam Cove is the second opening on the West side of the bay, and by steering along the western shore, about N. by E., it will be easily found.

The soundings round the Diego Ramirez are regular, and at the distance of half a mile from the southern island, on the East side, is a depth of 30 fathoms, with a bottom of fine green sand. The tides here are regular when the winds are moderate; and by the reports of my officers, who were several days on the island, it is high water, on full and change, at $2^h\ 15^m$, and rises about 5 ft. The flood tide, contrary to former reports, was observed to run to the N.E., and it evidently runs to the eastward between many of the main islands. The currents, or those streams which are propelled by prevailing winds, interfere so much with the natural tendency of the tide, that great doubt is created in regard to the proper direction of it.

Winds and Weather.—The heaviest and most lasting gale that blows in the neighbourhood of Cape Horn is from South, occasionally shifting a point or two each way. This gale I have frequently known to come on in a squall, and continue, in the tempestuous months, to blow from thirty-five to forty hours together. The southern horizon, filled with rising clouds, heavy and white, in a blue sky, is a sure indication of a lasting gale, with snow squalls. A complete calm generally follows this wind, which, however, is not very frequent. The wind at East invariably rises light, and gradually increases to a strong breeze; but when it veers from East to S.E., a strong gale may generally be expected, with snow or rain squalls.

A North gale also comes on gradually; and towards the end, which is generally about thirty hours, it draws from the N.W. and brings rain, and presently shifts into the S.W., without ceasing to blow, and continues from that point twelve or fifteen hours. All gales are of shorter duration in summer than in winter; and it may be remarked, that a vessel may anchor anywhere for shelter from a S.W. wind, without the fear of its shifting to the northward;

but the contrary must be guarded against, as the wind shifts from N.W. to S.W., continuing to blow with great violence.

In the most windy months N.W. gales blow with great force, when they rapidly rise near that point, and generally last twelve or fourteen hours. To the S.W. of Cape Horn they blow with less violence, but are more durable. In the summer season the winds, being S.W. and N.W., frequently blow in gusts of six or eight hours' continuance, at the strength of a brisk gale; it then becomes moderate, and the wind inclines to the northward.

In the summer I have observed the coincidence of fine weather with light easterly winds at the time of the new moon, when in the South declination, and at the time of full moon to blow strong from the northward. There being many exceptions, however, to the natural action of the wind, produced by localities, I have found it impossible to systematize the indications of the winds and weather satisfactorily. We must, therefore, rest contented with an approximation to certainty in these matters.—(A Voyage to the South Pole, Appendix, pp. 231—238.)

Remarks by Capt. F. W. Beechey, R.N.—About the parallel of Cape St. John we encountered strong S.W. winds with long heavy seas, and stretched to the southward to lat. 58° 2′ S., *regretting that we had not passed inside the Falkland Islands*, as, in that case, we should have been nearly a day's run further to the westward before we encountered these adverse winds. After two days the wind veered to S.S.W., and blew hard, but the sea was not high. We now stood to the N.W., and on the 17th, in lat. 56° 21′ S., long. 61° 51′ W., had a few hours' calm. This was succeeded by a breeze from the southward, and continued moderate, with fine weather and a smooth sea; and the next day, having carried us 123 miles, we made Cape Horn, 14 miles distant on the lee beam, bearing N. 2° W., *true;* the wind still from the southward.

Between Cape Horn and Diego Ramirez we had soundings with 45 fathoms rock, and 60 fathoms, sand; and afterwards from 84 to 60 fathoms, gravel, coarse and fine sand, and some coral. That night we passed to the northward of Diego Ramirez at 9 miles distant, not having less than 66 fathoms on a bottom of coarse sand. The following morning the Isles of Ildefonso bore N. 5° W., *true*, 9 miles, and we had 73 fathoms, fine sand; and at noon York Minster, at the entrance of Christmas Sound, bore N. 37° E., *true*, 19 miles, 82 fathoms, coral and stones. Not liking to range the shore of Tierra del Fuego so close during the night with a southerly wind, we tacked; and, with the wind still at S.S.W., stood for thirty-six hours to the S.E. into the meridian of Diego Ramirez; and, when 36 miles South of it, we again kept W. by S., with the wind at S. by W. We stood on, and had light winds, fine weather, and a smooth sea, until the 24th, when there was a calm for twelve hours, with a little swell from N.E. On the 25th, early, we got a north-easterly wind which commenced with fine weather and smooth water; and at noon on the

26th, carried us to the 79th meridian and 53rd parallel of latitude, when we considered ourselves round the Horn. In this situation we were 143 miles West of Cape Pillar; having numbered exactly fourteen days from the time at which we were 100 miles due East of Staten Land. We passed Cape Horn on one Sunday, and on the following crossed the meridian of Cape Pillar. Our greatest South latitude in the whole passage was 58° 2′ S. The gales of wind which we experienced were attended with a long swell, that by no means strained the ship, and we did not see a particle of floating ice.

With regard to the best time of the year for rounding Cape Horn there is a great difference of opinion, as in the same months both good and bad passages have been made; but I should certainly not select the winter time if I had my choice. Independently of the cold, which, during gales of wind, is severely felt by a ship's company necessarily wet and exposed, and the probability of meeting with floating islands of ice, surely the long nights, as Capt. Hall has justly observed, must augment, in a serious degree, the difficulties of the navigation.

From the passage of the *Blossom*, a preference might be given to the month of September; but in the very same month Capt. Falcon, in the *Tyne*, had a long and boisterous passage. I concur in opinion with Cook, Pérouse, Krusenstern, and others, in thinking there is no necessity whatever for going far to the southward, and I should recommend always standing on that tack which gained most longitude, without paying any regard to latitude, further than taking care to keep South (say a degree) of Cape Horn. With a N.W. wind I would stand S.W., and with a S.W. wind N.W., and so on. If there were a doubt, I should give preference to the southern tack, unless far advanced in that direction. We did not find the strongest winds near the land, but on the contrary; and I am of opinion that here, as is the case in many other places, they do not blow home; and that within 30 miles of the land the sea is broken by the inequality of the bottom. There is, however, great objection to nearing the land eastward of Cape Horn, in consequence of the velocity with which the current sets through the Strait Le Maire, particularly with a southerly wind. This does not obtain to the westward of Diego Ramirez, in which direction I see no objection to approaching the coast within 40 or 60 miles. Cook ranged this shore very close in December, and on more than one occasion found the current setting off shore, and at other times slowly along to the S.E.

In the first part of this passage the currents ran to the N.W., but after passing the latitude of 40° S., they set to the eastward; and when we arrived off Cape Horn the ship was S. 40° E., 116 miles out of her reckoning.

While we were in the neighbourhood of Diego Ramirez there was little or no current, but to the westward it ran to the W.N.W. It, however, soon after changed, and on our arrival off Concepcion the whole amount of current was N. 49° E., 147 miles. In rounding Tierra del Fuego, with a southerly wind,

full four points must be allowed for variation and current. For in this high latitude there will, in most ships, be found 10 or 12 degrees more variation with the head West and East; and though the true variation was but 24° E., at least 29 or 30 degrees must be allowed going westward.

We found the barometer in this passage an invaluable instrument; upon no occasion did it deceive us. In passing these latitudes my attention was drawn to the changes in the temperature of the water, which I usually found to precede a shift of wind from South to North, and *vice versâ*, even before that of the temperature of the air.

With regard to passing inside or outside the Falkland Islands, I think the latter preferable, especially in winter, as the winds sometimes hang in the eastern quarter at that period, and are apt to run a ship in with the River Plata.

We conclude these remarks with a brief summary of the information contained in a work published by the Meteorological Office in 1871.* In this work is a set of twelve charts, one for each month in the year, showing the winds recorded for each 5° square. It is a source of regret that they are not worked up in smaller areas for the region under consideration. Captain Toynbee says:—Is the easterly wind which exists in the 5° squares South of Cape Horn evenly spread over those squares, or is it more common to the southward than close up to the land?

"To answer this question, it would be necessary to work up the data of these few squares into 1° squares. It is, however, instructive to notice that the amount of easterly winds shown in high latitudes is greater in June than in January. In the above-named four squares between 55° to 60° S. and 60° to 80° W. there are 22 per cent. of winds with easting in them in June, whilst between 80° and 90° W., in the same month they amount to 67 per cent., no West wind being recorded in 33 observations. Now, according to Buys Ballot's law, this indicates a higher pressure towards the pole in winter, similar to what is found to exist to the North of Iceland in the Atlantic. But whether this higher pressure over South Shetland than over the sea to the North of it prevails all the year round is still a disputed question; if it does, a corresponding prevalence of easterly wind may be expected to exist near that land, while westerly winds are blowing near Cape Horn. But the navigator must consider the risk of more ice and longer nights at certain seasons when tempted to go South in search of easterly winds."

A subsequent work, published by the Meteorological Office in 1873†, confirms Captain Toynbee's opinion. The observations were taken by H.M. Ships *Erebus* and *Terror*, in the summers (December to March) of the years

* "Contributions to our knowledge of the Meteorology of Cape Horn and the West Coast of South America."

† "Contributions to our knowledge of the Meteorology of the Antarctic Regions."

1840—1843, and by H.M. sloop *Pagoda*, in January to March, 1845. The work drawn up by Mr. R. Strachan shows 792 observations made between the parallels of 60° and 65° S., and out of these 351, or nearly one-half, refer to easterly winds between N. by E. and S. by E., the most prevalent being from S.S.E. and S.E. Still further South, or between 65° and 80°, 954 observations were taken, and the winds found to prevail still more from the eastward and southward.

From what is stated above we may infer that easterly winds are more prevalent in high latitudes than near Cape Horn; and in some future edition of this work we hope to be able to give more definite information as to the winds observed in the intervening parallels between 55° and 60°.

With regard to the best months of the year for rounding Cape Horn, we give two tables, illustrating the per-centage of winds observed to blow from different points of the compass, and their mean force. The number of observations taken will serve to show the amount of reliance which may be placed on the deductions made.

Each column represents two points of the compass thus, North winds include all those observed to blow from between N. by W. and N. by E.; N.N.E., those from between N. by E. and N.E. by N., and so on.

On examining the tables it will be found that the months with the greatest proportion of easterly winds, from between N. by E. and S. by E., occur in the following order—June has the greatest, or 25 per cent.; next comes March, with 19; July, 17; April and May, 16; November, 14; January and August, 13; October and December, 11; February, 9; and September, the lowest, with only 3 per cent of easterly winds.

In *April* nearly the whole of the easterly winds are recorded between 65° and 70° W., only 5 records occurring out of 71 observations made between 70° and 80° W.

In *June*, although generally observed over the area, easterly winds appear to increase in frequency and strength in the western part. Between 80° and 85° W., S.E. winds are the most prevalent—a curious fact, as but few records exist of easterly winds in this area, and only in the months of March, April, and June.

In *August, September, and October*, easterly winds are only twice reported between 75° and 80° W., although 104 observations were taken.

A noticeable feature in the charts is the way in which the wind draws round the coast of Patagonia. With westerly winds, for instance, the arrows indicate a more northerly direction on the West coast, and more southerly on the East coast. With easterly winds, of course, the case is reversed.

The tables will give the reader some idea of what weather he may expect in the regions named for each month of the year, of course allowing for the earliness or lateness of the season.

For Winds, Currents, and Seasons near Cape Horn, see also pages 51-53.

TABLE *showing the Per Centage of Winds from different directions in the space South of Cape Horn, included between* 55° *and* 60° *S., and* 65° *and* 80° *W.*

	Number of Observations.	N.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.	Variables.	Calms.
Jan...	216	2	2	1	3	1	4	1	1	2	2	5	6	16	24	20	6	1	1
Feb...	98	10	1	1	3	0	4	0	0	0	3	3	21	11	13	8	19	1	2
Mar..	230	3	6	2	1	4	1	2	3	1	4	8	12	15	13	13	10	2	0
Apr...	143	5	0	3	2	1	2	2	6	0	6	3	17	23	12	9	6	3	0
May..	156	7	3	3	1	4	3	0	2	0	5	3	5	22	19	9	12	2	0
June .	236	5	3	2	4	5	4	3	4	5	10	15	11	12	5	4	3	1	3
July..	84	4	2	3	0	0	4	2	2	4	8	7	14	3	14	17	16	0	0
Aug. .	143	5	6	0	0	1	1	2	3	2	6	3	12	10	22	13	13	0	1
Sept. .	63	3	3	0	0	0	0	0	0	3	7	12	16	15	22	17	2	0	0
Oct. ..	216	3	2	0	4	1	0	2	2	3	8	5	17	18	15	10	8	0	2
Nov..	228	4	3	2	4	1	3	0	1	4	2	9	9	14	11	18	8	2	5
Dec...	315	4	2	1	3	2	0	0	3	3	4	6	13	17	22	8	8	2	2
Jan. to Dec.	2128	4.6	2.7	1.5	2.1	1.7	2 2	1.2	2.3	2.3	5.5	6.6	12	15	16	12	9.4	1.2	1.5

TABLE *showing the Average Force of the Winds according to Beaufort's Scale* in the area included between* 55° *and* 60° *S. and* 65° *and* 80° *W.*

	—	N.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.	Variables.	—
Jan ..	—	7	6	4	5	3	3	6	6	5	6	6	6	5	6	6	5	2	—
Feb...	—	5	10	5	3	—	—	—	—	—	4	5	6	7	7	5	6	3	—
Mar ..	—	6	6	6	3	4	5	4	4	5	4	6	6	7	8	7	6	4	—
April .	—	3	2	4	5	4	8	8	—	8	7	8	7	7	7	6	6	2	—
May..	—	5	4	7	6	7	—	4	—	6	5	6	6	6	7	7	5	2	—
June .	—	6	4	4	5	5	6	4	5	5	6	7	6	6	4	4	4	4	—
July..	—	4	10	4	—	—	5	6	7	6	6	8	7	7	7	7	7	3	—
Aug. .	—	9	7	—	—	5	1	3	7	6	6	6	9	9	8	8	7	—	—
Sept. .	—	5	5	—	—	—	—	—	—	6	6	9	7	7	7	8	2	—	—
Oct. ..	—	7	5	—	4	4	—	9	4	5	5	6	7	7	7	9	7	—	—
Nov..	—	4	6	5	4	3	5	—	5	5	5	7	6	6	6	6	7	5	—
Dec...	—	5	5	4	5	3	—	—	3	4	5	6	6	7	7	7	6	2	—
Jan. to Dec.	—	5.5	5.9	4	4.4	4.2	4.1	5.5	5.1	5.5	5.5	6.7	6.5	6.7	6.8	6.7	5.7	3	—

* Beaufort's Scale of Wind Force.—0, *Calm*; **1**, *Light Air*, just sufficient to give steerage way; **2**, **3**, **4**, *Light Breeze, Gentle Breeze*, and *Moderate Breeze*, with which a well-conditioned man-of-war, with all sail set, would go in smooth water and "clean-full" from 1 to 2 knots, 3 to 4 knots, and 5 to 6 knots, respectively; **5**, *Fresh Breeze*; **6**, *Strong Breeze*; **7**, *Moderate Gale*; **8**, *Fresh Gale*; **9**, *Strong Gale*. With force 5 she could carry in chase "full-and-by" royals, &c.; with force 6, single-reefed top-sails and top-gallant-sails; with force 7, double-reefed top-sails, jib, &c.; with force 8, tripple-reefed top-sails, &c.; with force 9, close-reefed topsails and courses; **10** represents a *Whole Gale*, with which she could scarcely bear close-reefed main-top-sail and reefed foresail; **11**, *Storm* would reduce her to storm stay-sails; and **12**, *Hurricane*, which no canvas could withstand.

THE STRAIT OF MAGALHAENS.

Passage Westward.

Atlantic to the Pacific.—The ample description of the physical features of this remarkable strait, by Capt. King and subsequent surveyors, are given in the first chapter of this work. The following general directions are by the first-named officer:—

The difficulties that present themselves to navigators in passing round Cape Horn, as well as from adverse winds as the severe gales and heavy sea that they are exposed to, are so great, that the Strait of Magalhaens has naturally been looked to as a route by which they may be avoided. Hitherto no chart has existed in which much confidence could be placed; but by the present survey, the navigation through it, independent of wind and weather, has been rendered much easier, since a correct delineation of its shores, and plans of the anchorages, have been made; and sufficient descriptions of them have been given to assure the navigator of his place, and furnish him with advice as to his proceedings. The local difficulties, therefore, have been removed; but there remain much more serious ones, which I should not recommend a large, or even any but a very active and fast-sailing, square-rigged vessel to encounter, unless detention be not an object of importance.

For small vessels, particularly if they be fore-and-aft rigged, many, if not all, of the local difficulties vanish; and inlets, which a ship dare not or cannot approach, may be entered with safety, and anchorage easily obtained in them. A large ship will perhaps be better off in entering and leaving the strait where there is open space and frequently a heavy sea; but for the navigation of the strait, a small vessel has considerably the advantage. She has also the opportunity of passing through the Cockburn Channel, should the wind be north-westerly, which will very much reduce the length of the passage into the Pacific.

One very great advantage to be derived from the passage through the strait is, the opportunity of obtaining as much wood and water as can be required, without the least difficulty; another great advantage is that, by hauling the seine during the summer months, from January to May, at the mouth of the river, or along the beaches at Port Famine, at the first quarter flood, a plentiful supply of fish may be obtained. Excellent fish are also caught at the anchorage with the hook and line, at all seasons, early in the morning or late in the evening. Fish may also be obtained with the seine at any other place where there are rivers. Freshwater Bay and Port Gallant are equally productive. On the outer coast of Tierra del Fuego an excellent fish may be caught in the kelp.

The foregoing remarks apply to such *sailing vessels* as may be induced to enter upon the tedious and difficult passage to the westward, without, as Capt. King says, offering any inducement for a short-handed or heavy ship to attempt it.

With *steam vessels* the case is very different, and here the quieter seas, the secure anchorages, and the certainty of a passage, make it a very desirable route. When H.M.S. *Rattlesnake* entered the Pacific in May, 1853, she was towed through by the *Vixen*, in eight days, after anchoring seven times.

As said before, it is almost certain that a merchant sailing vessel will be in trouble by attempting the western passage. The anchorages are small and confined; the number of tacks required seem to prove that no large ship but a man-of-war could ever succeed in accomplishing the passage, in anything like a moderate space of time; with a small fore-and-aft rigged vessel the case is very different. And setting aside the saving in wear and tear, the men having all night in, in such a climate, would be no slight advantage.—*Captain Trollope, R.N.*

The length of the Strait of Magalhaens is about 317 miles; or, by the Magdalen and Cockburn Channels, 260 miles.

There is much advantage to a *steamer* in passing through, in the abundance of wood which everywhere is to be cut, and which, with *coal* (see page 23), will keep up steam. The quiet navigation of these inland waters may be extended beyond the Strait of Magalhaens, by passing up the interior channels of the western coast of Patagonia, described on pages 96—117.

For other matters respecting the Strait and the other channels, the reader is referred to the descriptive remarks at the commencement of the work.

Passage Eastward.

From the Pacific to the Atlantic.—The advantage which a ship will derive from passing through the strait, from the Pacific to the Atlantic, for there must be some great one to induce the seaman to entangle his ship with the land when fair winds and an open sea are before him, is very great. After passing through the strait, the prevailing winds being westerly, and more frequently from the northward than from the southward of West, they are fair for his running up the coast; or, if not, the ship is not liable to receive much injury from the sea, which is comparatively smooth; whereas, to a ship passing round the Horn, if the wind be N.W., she must go to the eastward of the Falkland Islands, and be exposed to strong gales and a heavy beam sea, and hug the wind to make her northing. To a small vessel the advantage is incalculable; for, besides filling her hold with wood and water, she is enabled to escape the severe weather that so constantly reigns in the higher latitudes of the South Atlantic Ocean.

Coming from the northward it will be advisable to keep an offing until the western entrance of the strait is well under the lee, to avoid being thrown upon the coast to the northward of Cape Victory, which is rugged and inhospitable, and forming, as it were, a breakwater to the deep rolling swell of the ocean, is for some miles off fringed by a cross hollow sea, almost amounting to a rippling.

For a small vessel, the passage through the strait from West to East is not only easy, but to be strongly recommended as the best and safest route. Indeed, I think the passage would be quite as expeditious, and perhaps much safer, to enter the Gulf of Trinidad, and pass down the Concepcion Strait, the Sarmiento or St. Estevan Channels, and Smyth Channel, and enter the strait at Cape Tamar. In these channels northerly winds prevail, and there is no want of convenient and well-sheltered anchorages for the night, many of which have already been mentioned, and multitudes of others, and perhaps much better ones, might be found.

For *steam vessels* there can be no question as to which passage to take, round the Horn, or through the Strait, the advantage being in every way with the latter. Besides wood and water in abundance, the good anchorages, the freedom from outlying dangers, except those plainly indicated in the descriptions, and the quietude of the sea, there is the option of lying at anchor all night in one or other of the numerous places pointed out—thus saving the crew all the harassing fatigue attendant on the stormy outside voyage.

As stated in the remarks on the westward voyage, these advantages may be extended by passing down the Sarmiento, Smyth, and other interior channels from the Gulf of Peñas, which offer the same advantages of quiet sea, good anchorages, wood and water, as the Strait of Magalhaens. When bound to the southward, and arriving off the Gulf of Trinidad in fine weather, mariners should not hesitate to take advantage of the favourable opportunity to enter the channel, and continue their passage in smooth water.

To heavy copper-laden vessels, too, these inner waters are very advantageous in avoiding the strain of the tempestuous weather, and with the precautions which have been inculcated before, they can be used with facility and advantage.

The following remarks are by Mr. J. H. Smith, who passed through the strait from the eastward in January, and from the westward in July.

The winter months no doubt are the best to make a passage through from the *eastward*. Captain King remarks, you have much finer weather and frequent easterly winds, both of which I experienced.

In a square-rigged vessel I would not attempt the passage from East to West, not from any fear of wreck, but the detention likely to accrue; and, for this reason, putting back occasionally from the place you start from would be no uncommon circumstance. In two or three instances, when I was obliged to do so (say to Tamar Harbour or Borja Bay), had not the *Mary Anne* been

a handy and good sailing vessel (a schooner) we should not have been able to gain the anchorages, and in that case lost as much ground as would have taken days to fetch up.

It may be well enough for Her Majesty's ships, with plenty of hands, when detention, at times, is no great object, but not for merchant vessels, who have no more than just sufficient to weigh an anchor, and almost everything depends upon the facility with which they perform their voyages.

From the *westward*, in the summer months, I should not hesitate, in any vessel, to come through; the nights being short, and constant westerly winds, you may choose your anchorages. My passage through, last July, answered a double purpose, although longer than I had reason to expect. We procured wood and water, repaired sails, rigging, &c., and in a measure recruited the crew, they being in their beds every night; for I am well aware that, had we come round Cape Horn, not one of them would have weathered it out. The scurvy had already made its appearance, and all complaining of sore feet, caused by constant wet with salt water. I always made it a point, ere I started in the morning, to secure an anchorage before dark, owing to the crew being in a sickly state.

PASSAGES ON THE WEST COAST OF AMERICA.

Chile.

Capt. FitzRoy says:—How to make passages is easy to tell, for there are but two ways. When going to the northward, steer direct to the place, or as nearly so as is consistent with making use of the steady winds which prevail in the offing; and, if bound to the southward, steer also direct to the place, if fortunate enough to have a wind which admits of it; but, if not, stand out to sea by the wind, keeping every sail clean full, the object being to get through the adverse southerly winds as soon as possible, and to reach a latitude from which the ship will be sure of reaching her port on a direct course. Every experienced seaman knows that, in the regions of periodic winds, no method is more consistent with quick passages than that of "hugging the wind." When Rear-Admiral Sir Thomas Hardy was on the coast, he used to cross the southerly winds with a topmast studding-sail set, his object being to get through them.

Peru.

With regard to making passages along this coast, little difficulty is found in going to the northward; a fair offing is all that is requisite to ensure any vessel making a certain port in a given number of days; but in working to windward some degree of skill and constant attention are necessary.

Much difference of opinion exists as to whether the in-shore or off-shore route should be preferred; but Capt. FitzRoy's experience, added to the information he obtained from those who were said to understand the navigation of that coast, led him to suppose the following mode to be the best:—

On leaving Guayaquil or Payta, if bound to Callao, work close inshore to about the Islands of Lobos de Afuera. All agree in this. Endeavour always to be in with the land soon after the sun has set, that advantage may be taken of the land wind, which begins about that time. This will frequently enable a ship to make her way nearly along shore throughout the night, and place her in a good situation for the first of the sea breeze.

After having passed the before-mentioned islands, it would be advisable to work upon their meridian, until you approach the latitude of Callao; then stand in, and if it be not fetched, work up along shore, as above directed.

Some people attempt to make this passage by standing off for several days, hoping to fetch in on the other tack; but this will generally be found a fruitless effort, owing to the northerly set that takes place on approaching the Equator.

For a vessel bound from Callao to Valparaiso, there is no question but that, by running off with a full sail, the passage will be made in much less time than by working inshore, for she may run quite through the trade, and fall in with the westerly winds, which are always found beyond it. But for the intermediate ports (excepting Coquimbo) the case is different, as they lie considerably within the trade wind, and must be worked for by that alone.* For these ports it may be recommended to work along shore as above directed, as far as the Island of San Gallan, from whence the coast trends more to the eastward, so that a long leg and a short one may be made (with the land just in sight) to Arica, or to any of the ports between it and Pisco.

From Arica, the coast being nearly North and South, vessels bound to the southward should make an offing of not more than 45 to 60 miles (to ensure keeping the sea breeze), and work upon that meridian till in the parallel of the place to which they are bound. But on no account is it advisable to make a long stretch off; for as the limit of the trade wind is approached, it gradually hauls to the eastward, and great difficulty will be found in even fetching the port from which they started.

The average passage, in a well-conditioned merchant vessel, from Guayaquil to Callao, is from fifteen to twenty days, and from Callao to Valparaiso about three weeks. Fast-sailing schooners have made these passages in much less time; and there is an instance of two men-of-war, in company, having gone

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* A very dull sailer indeed, in this case, might do better by running through the trade, and making southing in the offing, so as to return to the northward along the coast, than by attempting to work to windward against a trade wind, which never varies more than a few points.

from Callao to Valparaiso, remained there two days, re-anchoring at Callao on the 21st day. But these are rare occurrences, and only to be done under most favourable circumstances, such as meeting with a "norther" soon after leaving Callao.

Sailing vessels bound from Guayaquil to Valparaiso should stretch out to sea, crossing the Peruvian current before passing the meridian of 92° W. From this they should push to the southward, not caring about being driven to the westward if southing can be made, as they will have no difficulty in making their easting on the parallel of Valparaiso. This passage is generally made in 37 days.

Commodore R. A. Powell, H.M.S. *Topaze*, 1867, says:—Ships making the passage from Callao to Valparaiso will generally have to pass through a calm belt; when they meet with it the best plan is to use steam, or they may be 6 or 7 days rolling about before getting through it. The belt of calm is generally found on the edge of the trade wind; between September and April, as far South as 31° S., and between April and September at 18° S.

In making the passage from Vancouver Island to Valparaiso in November, 1872, H.M.S. *Scylla* went to the parallel of 41° S. before making her easting, making a good passage of 46 days.

Remarks by M. Lartigue.—The navigation of the Peruvian coast is very easy in summer; the breezes are moderate; the weather, which is generally clear, allows the latitude to be observed nearly every day, and to recognize, by this means, the part of the coast opposite to which you may be. There is then no inconvenience in keeping a moderate distance off, so as to meet with fresh breezes, and thus shorten the passage.

The weather, which is often cloudy in winter, will not allow of observations to be taken every day, and you must then direct your course by your dead reckoning, or from the more remarkable objects lying on the coast. Those which are met with between the Quebrada Camarones and the valley of Tambo may be made out at a considerable distance, so that when between these two remarkable points you may proceed by keeping 7 or 8 leagues off the land. At this distance the sea breezes keep up through the greater part of the night.

The only objects at all remarkable that are to be met with between the valley of Tambo and that of Quilca are the points of Ilay and Cornejo, but these cannot be made out at more than 3 or 4 leagues off, for when farther off they appear confounded with the high land of Peru. It seems that, in this season, you must continue to fix your position by the sight of the land, and so follow the coast at less than 3 or 4 leagues distant; but as you then only find light airs, interrupted by calms which may last for several days together, you run the risk of being carried too near the land by the heavy swell which is felt on all its extent. The depth on it is considerable, and the quality of the bottom very bad; it is only at the openings of the valleys that you can hope to find, at 2 or 3 miles from the shore, less than 25 fathoms water, over a bottom of mud or

fine sand. The only advantage that will be gained by sailing so near the land, will be to profit by the slightest breeze to get an anchorage, and to be seldom exposed to the chance of overrunning it; but these advantages, as will be seen, are not of a nature to compensate for the inconveniences, or rather the dangers, to which it exposes a ship.

It would, therefore, be better to sail farther off the land, keeping at 7 or 8 leagues distance; as when between the Quebrada Camarones and the valley of Tambo the swell is not felt at this distance, and the winds will be fresh; but the currents, which constantly run to the N.W., cause the reckoning to be very erroneous, and you may be carried to leeward of your port, or the anchorage you may be seeking. Beyond this, this inconvenience is without danger, and cannot occasion more than a hindrance; for in returning to the required destination, sailing to the southward, you must run to the offing, bear up to the wind, and then, approaching the land, reach the port which has been overrun.

It is, notwithstanding, necessary, following the general rule, to make an exception, which in some circumstances may shorten the passage. We have said that the breeze was sometimes tolerably fresh, and that then the counter current, which runs to the South along the land, extends some miles in the offing; it is evident that it would be better to work in this counter current, at all times when the force of the wind allows it, and you have not overrun your port more than 2 or 3 leagues; but if you should have done so to a greater distance, it will be preferable to take directly the first course, and profit by this breeze to get away from the land.

It will be advantageous to manœuvre thus every time you are on any portion of the coast which is described.

What has just been said relative to the mode of navigating and running along the coast of which we have been speaking, applied to the portion comprised between the valleys of Quilca and Ocoña. But it is necessary to observe, that the valley of Camana, which is also as easy to be made out at 7 or 8 leagues distance as that of Quilca, has the inconvenience, as well as the latter valley, of not being perfectly recognizable when it bears to the N.E., when it is passed, and you cannot sometimes reach the anchorage on that tack.

In winter, as in summer, you must always be particular to approach the land to the South of the intended port, and then range the land at a short distance. The breezes being more fresh in summer, and the swell less heavy, make the ports present fewer difficulties than in winter.

Captain Basil Hall's Passages on the Coast of Peru.

From Valparaiso to Lima, 27th January to 5th February, 1821 (9 *days*).—The wind on this passage is always nearly the same, viz., S.S.E. It sometimes hauls a point or two to the eastward, but the passage is always certain. The only precaution to be attended to is to run well off the land in the first instance,

say 150 miles on a N.W. course, and then steer direct for San Lorenzo, a high and well-defined island, forming the eastern side of Callao Bay. It is usual to make the land of Morro Solar, which lies 10 miles to the southward of Callao, and then run into the roads by the Boqueron Passage, or proceed round the North end of San Lorenzo. By attending closely to the directions on Mr. Foster's chart, transmitted to the Admiralty, any vessel may safely enter the Boqueron; but great attention must be paid to the lead and the bearings, and an anchor be kept ready to let go.

It is generally calm in the mornings, and sometimes foggy; but about 11 o'clock it clears up, and the breeze freshens from the southward, which enables ships to reach the anchorage generally without a tack, after rounding the North end of Lorenzo: so that, upon the whole, this outer route, which is entirely free from danger, is preferable to the other, at least for a stranger.

Lima to Valparaiso, 28th February to 18th March, 1821 (18 *days*).—The return passage from Peru to Chili requires some attention, and may generally be made by a man-of-war in less than three weeks; it has been made in less than a fortnight by a frigate, which, however, on the next occasion, took 28 days. The point which contributes most to the success of this passage is keeping well off the land after leaving Lima, and not having any scruples about making westing, provided southing can also be gained. The S.E. trade wind, through which the greater part of this course is to be made, invariably draws to the eastward at its southern limit, and therefore a ship eventually can always make her southing. The object, however, being to get past the trade and into the westerly winds, which lie to the southward, a ship ought to keep the wind, at least abeam, while crossing the trade. In winter, that is, when the sun is to the northward of the Equator, the trade wind blows steadier, and its southern extreme lies 4° or 5° to the northward of its summer limit, which may be taken at about 30° or 31° S.

The sun was near the Equator when this passage was made, and we retained the trade wind as far as 31° S., after which we had northerly and N.W. winds as far as the Island of Mas-a-fuera, when it shifted to South, and then to S.E. by S., blowing fresh. This changed to S.S.E., the regular coast wind, as we drew inshore. During summer the land ought always to be made to the southward of the port. In winter, when hard North winds are frequent, this is not advisable. Perhaps, at such seasons, a direct course for Valparaiso may be the best, after losing the trade wind.

Valparaiso to Lima, by the "Entremedios," or Intermediate Ports, 27th May to 24th June, 1821.—From Valparaiso we steered at the distance of about 69 miles from the coast, as far as lat. 22½° S., when we hauled in, and afterwards coasted along in sight of the shore, at the distance of 7 or 8 leagues, as far as Arica. The winds being light from S.S.E., it was not till the 7th of June that we anchored there. From thence we coasted along by Quilca, Morro de Sama, and Ilo, to Mollendo, the winds being generally from the eastward, and draw-

ing off shore at night; calm in the mornings; and hauling in from the sea in the day, the weather invariably fine. From Mollendo* to Lima we had a fresh breeze off shore about S.E. On approaching the Morro Solar the wind fell light, and we were obliged to tow the ship through the Boqueron Passage into Callao Roads.

There is no difficulty in making a passage along the South coast of Peru from the eastward; but from the westward a great deal of vigilance is requisite to take advantage of every occasional shift of wind, since by this means alone can a passage be made. The best authorities are, I think, against standing out to sea to the south-westward, in the hopes of fetching in upon the starboard tack. The *Constellation*, American frigate, tried this passage, but she lost a great deal of time thereby, being at least three weeks in going from Lima to Mollendo.

The *San Martin*, bearing Lord Cochrane's flag, made the passage to Arica, which is considerably farther, in thirteen days, by keeping inshore, and taking advantage of the changes which take place, with more or less regularity, every evening and morning.

As the weather along the South coast of Peru is invariably fine, ships are not otherwise incommoded at the various anchorages, than by a high swell, which always rolls in at the full and change of the moon. Arica is the only place having any pretensions to the name of a harbour; but the several bays described in Mr. Foster's Memoir may be considered safe, provided the ground-tackling be good.

Chorillos (near Lima) to Valparaiso, 10th to 28th of August, 1821 (18 *days*).—This being what is called the winter passage, we lost the trade wind in lat. 25° S., after which we had the winds to the S.W. as far as lat. 27° S., long. 88° W., when it shifted to the N.W. and West, and so to the S.W. and South, as far as lat. 33° S., long. 78° W. We were much embarrassed by calms, light winds, and heavy rains, after which the wind came to the northward and N.N.W., with thick, rainy weather. We made the land to the southward of Valparaiso on the 27th, and got in next day by the wind coming round to the S.W.

At this season of the year, when northerly winds prevail, with heavy rain and unpleasant weather, it does not seem advisable to make the coast to the southward of the port. Neither ought a ship, I think, to run into Valparaiso in one of these gales, since the wind frequently blows home, and is attended by a high swell. During the winter the best ground-tackle ought to be laid out to the northward, and a berth taken sufficiently far from the shore to allow of

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* As stated in the description of these ports, on page 222, Mollendo is now of considerable importance. By a decree of the Peruvian Government, dated January 6, 1871, the Port of Islay was declared closed to commerce, and vessels have to land their cargoes at the Port of Mollendo.

veering, in the event of bad weather coming on. It does not seem necessary to take more than barely room for this purpose, since, by lying near the shore, there will be always an undertow, which relieves the sea-cable of great part of the strain. As the launch will on these occasions be apt to swamp at her moorings, she ought to be hoisted in before the gale comes on, of which the barometer, the threatening aspect of the weather, and the rising swell, generally give sufficient warning. Previous to a "norther," also, the land of Concon, and that beyond it to the northward, are seen with unusual sharpness and distinctness.

This passage in eighteen days may be termed short. Formerly thirty days was usual, it afterwards sank to twenty-five days, and, at the period of our arrival, three weeks was considered good. Sir Thomas Hardy, in his Majesty's ship *Creole*, made the passage from Huacho in something less than fourteen days, the distance being more than 2,200 miles. This was early in May, 1821; and it is well worth attending to, that the trade wind was crossed with a fore-top-mast studding-sail set, no regard being paid to any object but getting through the trade wind as fast as possible. The same ship, however, in February and March of the following year, was twenty-eight days making the passage, but this is unusually long for a man-of-war.

Valparaiso to Concepcion, Bay of Arauco, and Island of Mocha, 1st to 21st October, 1821.—As the prevalent winds along this coast are from the southward, it is necessary to take advantage of every slant that will allow of southing being made, and we were fortunate in meeting with a westerly wind on the third day after sailing, which carried us more than half the distance. The wind subsequently was S. by W., which made the rest of the passage to Concepcion almost a dead beat. We arrived at Talcahuana, in Concepcion Bay, on the 8th. During the 9th it blew fresh from the northward. We afterwards beat up to the Bay of Arauco, and to the Island of Mocha, in 38° 19′ S., having on this occasion been favoured with a south-easterly breeze, and then a southerly one, to stand in with.

We endeavoured to reach Valdivia also, but the wind came from S. by E., and blew so hard that we were obliged, for want of time, to give it up. On the return passage to Valparaiso, we had light N.W. and West winds, then S.W., and so on to the southward, and S. by E., which is the most common wind.

These particulars would seem to point out that a passage may always be made to the southward; for the winds are seldom steady for twelve hours, and by taking care to profit by every change, southing must be made.

The passage from Valparaiso to Concepcion is generally made in ten days, which is also the usual time required for a passage to Lima. The distance, however, in the first case, is 200 miles, and in the latter 1,320 miles—a circumstance which points out very decidedly the direction of the prevalent winds.

Valparaiso to Lima, calling at Coquimbo, Guasco, Copiapò, Arica, and Mollendo, 15th November to 9th December, 1821 (24 *days*).—The winds during these passages along shore are always light, and from the southward, hauling in from sea during the day, and freshening from off the land in the night.

Between Mollendo and Callao there is a pretty steady breeze from E.S.E., with a drain of current along shore—a remark which applies to the whole coast from Valparaiso to Lima.

A remarkable increase of the great S.W. swell is observable at the full and change of the moon on the coast, especially from Arica to Huacho inclusive—a circumstance which renders it difficult, and sometimes impossible, to land at those places.

Lima to Pacasmayo, Payta, and Guayaquil, 17th to 25th December, 1821.—The winds between Lima and Guayaquil are moderate from the southward; at night hauling to the south-eastward, and in the day from S.S.W.

This is the period at which the rains are expected to set in, and the heavy, threatening aspect of clouds over the hills gave us reason to expect that we should not escape, but none fell during our stay, between the 23rd and the 30th of December.

The passage from Guayaquil back to Lima requires attention, as may be seen from the following directions, which I obtained from Don Manuel Luzurragui, captain of the Port of Guayaquil.

" The average passage, in a well-found and a well-managed ship, is twenty days; eighteen is not uncommon; and there is an instance of a schooner doing it in twelve. From the entrance of the river as far as Punta de Aguja (in lat. 6° S.), the shore must be hugged as close as possible, in order to take advantage of the changes of the wind, which take place only near the shore. In this way, by due vigilance, slants may be made every day and night. On reaching Punta de Aguja, work to the southward, as nearly on the meridian of that point as may be, as far as 11½° lat., and then strike inshore for Callao, and if it is not fetched, creep along shore, as formerly directed.

Persons accustomed to the navigation between Lima and Valparaiso are tempted to stand boldly out, in hopes of making their southing with ease, and then running in upon a parallel. But this is not found to be practicable; and indeed the cases have no resemblance, since the passage to Valparaiso is made by passing quite through the trade wind and getting into the variables; whereas Lima lies in the heart of the trade; accordingly a ship that stretches off from Guayaquil comes gradually up as she stands out, and finally makes about a South course; when she tacks again, the wind shifts as she draws in, and she will be fortunate if she can retrace her first course, and very often does not fetch the point left in the first instance.

To work along shore with effect, the land must be kept well on board, and

constant vigilance be bestowed upon the navigation, otherwise a ship will make little progress.

Capt. Andrew Livingston, well known in the nautical world, makes the following remarks on navigating to windward from Huanchaco to Callao :—The most intelligent, experienced persons with whom I conversed, generally recommended standing off-shore during the night, and in-shore during the day; but advised that any person in charge of a vessel beating thus to windward, should take care to be pretty close to the shore by sunset, to take advantage of the wind, which about that time generally draws rather off the land, though not sufficiently to deserve the name of a land wind.

On the above I remark, that on account of the land trending so much to the eastward, if you stand twelve hours off-shore and twelve hours in-shore, at the same rate of sailing, and have gained any southing of consequence, you will still be a considerable distance off-shore when your twelve hours are completed standing in; and I think that it will be found in general most advisable to stand off only about ten hours, and in for fourteen hours; as, even if you get inshore rather too soon, you can, by making a short tack or two, be sure of being near the shore at sunset, when you may expect the wind rather to favour you for gaining southing with your port tacks on board.

On the tack off-shore you will generally find that the vessel comes up more and more as you stand off, but do not let this persuade you to stand off too far, even should the vessel head up South, or S. by E. by compass, as you will lose more on the inshore tack, when you must be headed off in proportion as you have headed up on the off-shore tack. The inspection of the chart will at once convince any person of this fact, even if there is no northerly current, and if there is (as is frequently the case) a northerly current, of course bringing that directly on or abaft a vessel's beam, must sag her to leeward.

On the coast of Peru, the water is frequently of a dirty brown colour, and sometimes quite red, as if mingled with blood. Some say this is caused by fish spawn, others that it is occasioned by small crabs. I cannot say what it is, for I had no microscope, and the water, when drawn even from the reddest spots, showed no colour in a glass, although it looked rather muddy; nor could I perceive any animalculæ in it with the small magnifying glass attached to my sextant.

CENTRAL AMERICA, MEXICO, ETC.

Our information as to the best means of making a passage along these coasts is as yet but scanty. The following observations, therefore, by Lieut.-Commander James Wood, of H.M.S. *Pandora*, become exceedingly valuable. In a former page we have given the observations on the prevalent winds in this region from the same officer.

From the Southward to Panama Bay.—From what has been said respecting

the winds which prevail within the first division, it will be seen that the passage from the southward to Panama Bay is easily made during the greater part of the year; but in the fine season, when within the influence of the northers, the following plan should be adopted. Make short tacks inshore, as there is generally a set to the northward found within a few miles of the land, and where that is interrupted, a regular tide is exchanged for a constantly contrary current farther off. Between Chirambira Point and Cape Corrientes the land is low and faced with shoals, caused by the mouths of the numerous rivers which have their outlets on this part of the coast, but after passing Cape Corrientes, it may be approached pretty closely, except off Francisco Solano Point, where some shoal rocky patches extend to seaward, as the coast is in general bold-to. Care, however, should be taken not to run into the calms caused by the high lands, as it is difficult to get off into the breeze again, and the swell sets inshore where it frequently happens that no anchorage is to be found till close to the rocks.

In beating up the Bay of Panama in the fine season, the eastern passage, or that between the Islas del Rey and the main, is to be preferred, as, with one exception, it is free from dangers. The water is smooth, and a regular tide enables you to make more northing than it would be possible to do, in nine cases out of ten, against the strong current and short high sea which at this season prevail in the centre or on the western side. During the rainy season, a straight course up the bay is preferable to entangling yourself with the islands, the current generally following the direction of the wind.

From Panama Bay to the Southward.—But the great difficulty at all times consists in getting either to the southward or westward of Panama. The passage to the southward is made in two ways—either by beating up the coast against a constantly foul wind and contrary current, or by standing off to sea till sufficient southing is made to allow you to fetch your port on the starboard tack. Both plans are very tedious, as it frequently takes twenty days to beat up to Guayaquil, whilst six or seven days are an average passage down.

From Panama Bay to the Westward.—If bound to the westward during the northers, a great deal of time may be saved by keeping close inshore, and thus taking advantage of them; they will carry you as far as the Gulf of Nicoya. When past the Morro Hermoso, "Papagayos" may be looked for, and with them a course should be steered for the Gulf of Tehuantepec, when it will depend on the port you are bound to, whether, after crossing the gulf by the aid of one of its gales, you should keep in or off-shore. If bound for Acapulco, keep in and beat up; but if bound to the westward, you cannot do better than make a West course, as nearly as the winds will allow you.

The passage to the westward from Panama during the rainy season is a most tedious affair, calms, squalls, contrary winds and currents, accompanied by a heavy swell and extreme heat, as well as an atmosphere loaded with moisture

and rain, are the daily accompaniments. It often occurs that 20 miles of westing are not made in a week, and it is only by the industrious use of every squall and slant of wind that the passage can be made at all. Opinions are divided amongst the coasters as to the propriety of working to the southward and trying to get rid of the bad weather, or beating up within a moderate distance of the land. My experience would lead me to prefer the latter, as the strong winds and frequent squalls which so often occur near the land sometimes allow a good long leg to be made to the north-westward, while, farther off, this advantage is sacrificed for only a shade finer weather.

CAPE HORN TO CALIFORNIA, ETC.

As in the Atlantic Ocean, the route from South to North, or *vice versâ*, in the Pacific, by crossing the different belts of winds and calms, requires much consideration as to the best points for crossing the various parallels of latitude and the Equator. The entering or leaving one zone at the most advantageous point has a very great influence on the speed and safety of the ship through the rest. Therefore this meridional voyage must be considered with reference to the countries beyond the scope of this work. What has been previously said on the winds and currents will be necessary to understand the requirements of this section.

To Capt. Maury, and also to the Dutch Meteorological Institute, under Capts. Jansen and Von Gogh, we owe very much for their lucid discussions and long series of examples from which a correct decision may be arrived at. We therefore quote the words of the former, but omit the tables upon which the conclusions are based. They are very interesting, but lead too far from our subject.

I wish here to call the attention of navigators to the winds they are to expect between the parallel of 50° S., in the Pacific, and the Equator especially, as it regards their reliability.

The distance from the fairway of San Roque (lat. 7° S.) to the parallel of 50° S., in the Atlantic, is about 2,900 miles, the average time 30 days, and the mean daily run is about 100 miles.

The distance from 50° S. in the Pacific to the usual crossing place on the line—California track—is about 3,300 miles, the average time 27·7 days, and the mean daily run 132 miles.

The winds between 50° S. and the Equator are much more strong, steady, and reliable, as the barometer would lead us to expect, on the Pacific, than they are on the Atlantic side of the continent; the ratio between them in these respects is greater than 2,900 to 3,300, for it is easier to make 3,300 miles with them in the one ocean than it is to make 2,900 in the other.

An examination of the mean monthly passages from crossing to crossing will also show a greater regularity, implying thereby more stable winds The

greatest monthly average on the East side is 31·1 days in August; on the West 27·9 in May, extreme difference, 3·2 days; the greatest monthly average on the West side being 27·9 days; the least 22·2 days; the extreme difference is 5·7 days.

Between the Equator and 10° or 12° N., according to the season of the year, the California bound navigator may expect to lose the S.E., and to get the N.E. trade winds.

He will find these last nearer the Equator in January, February, and March; but in July, August, and September, he will sometimes find himself to the North of the parallel of 15° N. before he gets fairly into the N.E. trades. And sometimes, especially in summer and fall, he will not get them at all, unless he keeps well out to the West. Having them, he should steer a good rap full at least, aiming, of course, to cross the parallel of 20° N., in about 125° W., or rather not to the East of that, particularly from June to November. His course, after crossing 20° N., is necessarily to the northward and westward, until he loses the N.E. trades. He should aim to reach the latitude of his port without going to the West of 130° W., if he can help it, or without approaching nearer than 250 or 300 miles to the land, until he passes out of the belt of the N.E. trades, and gets into the variables, the prevailing direction of which is westerly.

"Where shall we take the S.E. and lose the N.E. trades on the passage to California?" is an important question for a navigator to have answered, who is striving for a short passage on the West Coast of South America. From the parallel of Cape Horn up to the belt of light winds and calms, through which you generally pass before getting into the S.E. trades, the prevailing winds are westerly winds, having northing more frequently than southing in them.

Vessels bound to San Francisco should not, unless forced by adverse winds, go any farther beyond the meridian of 130° W. than they can help. Supposing that vessels generally will be able to reach 30° N. without crossing the meridian of 130° W., the distance per great circle from Cape Horn to its point of intersection with that parallel is about 6,000 miles.

And supposing, moreover, that California bound vessels will generally, after doubling Cape Horn, be able to cross the parallel of 50° S., between the meridians of 80° and 100° W., their shortest distance in miles thence to 30° N., at its intersection with the meridian of 130° W. would be to cross 40° S. in about 100° W.; 30° S. in about 104°; 20° S. in about 109°; the Equator in about 117° W.; and 30° N. in about 130° W. (126° if you can). By crossing the line 10° further to the East, or 10° further to the West of 117°, the great circle distance from Cape Horn to the intersection of 30° N. with 130° W., will be increased only about 150 miles.

Navigators appear to think that the turning point on a California voyage is the place of crossing the Equator in the Pacific. But the crossing which may

give the shortest run thence to California, may not be the crossing which it is most easy to make from the United States or Europe; and it is my wish to give in these sailing directions the routes which, on the average, will afford the shortest passages to vessels that have doubled Cape Horn; and then, by comparing the two, we may be able to lay down the best route from Cape Horn to California.

There are 87 crossings between 115° and 120° W. They give the shortest average time to San Francisco; their average, however, is only 16 hours (0·6 day) less than the average from the crossing between 110° and 115°, and the average to the latter crossing from 50° S. in 8 hours (0.3 day) shorter than the average to the former crossing. Hence we conclude from a total of 441 passages from the line, and of 448 to the line, that the average passage from 50° S. to San Francisco is 53·5 days viâ the crossing between 115° and 120° W., and 53·8 days viâ the crossing between 110° and 115°. Thus, in the long run the crossing between 115° and 120° gives the best average, but is not so much frequented as that between 110° and 115°, the numbers being respectively 103 and 220 passages.

A long series of tables derived from the voyages quoted is given by Capt. Maury in elucidation of the subject, which are very interesting. We give his concluding remarks on the discussion.

It appears from the summing up that the average passage to California for all classes of ships that used the charts and crossed the Equator between 105° and 120° is, in the year round, 130 days. When these investigations commenced, the average passage the year round of all classes of ships, from the Atlantic ports of the United States to California, was 180 days.

Indeed, it may now be considered as reduced to 128 days, for that is the average of the 87 vessels that crossed between the meridians of 115° and 120° W., which these investigations have shown to be the best crossing place. Indeed, the average of the 220 vessels that have crossed between 110° and 115° W., taken with the 87 that have crossed between 115° and 120°, makes the average rather less than 129 days.

The vessels that sail in the spring have, in the aggregate, an average passage 10 days longer than those which sail at other seasons, the spring average being 137 against 127 days for the rest of the year.

The average crossing place of 50° S. in the Pacific is about 82° W. Winds are sometimes. though not often, fair for making westing on the polar side of 50° S. When they are so, the skilful navigator will not fail to take advantage of them to gain a still more westerly crossing of this parallel.

In urging upon California bound vessels the importance of making westing about the parallel of 50° S., I do not mean that they should expose themselves to heavy weather, or contend against adverse circumstances. I simply mean that if a vessel, after doubling the cape, can steer a W.N.W. course as well as a N.W., or a N.W. as well as a N.N.W., or a N.N.W. as well as a

North course, that she should on all such occasions give preference to the course that has most westing in it, provided that she does not cross 50° S. to the West of 100° or thereabouts, nor 30° S. to the westward of 115°, nor enter the S.E. trade wind region to the West of the last named meridian. This is the western route. It is so called because it requires you to keep as far West, within certain limits, as you well may without running broad off to make westing, or without fighting with head winds, or baffling winds, or calms to get West.

The western route from Cape Horn to California is, as a rule, to be preferred by all vessels, at all seasons.

The further from the land, the more regular and steady the wind, may be safely taken as a general rule.

These remarks, and the illustrative chart of the passages, will serve to elucidate this route.

BETWEEN CALIFORNIA AND AUSTRALIA.

By Captain Maury.

The great circle distance from South Australia to California is about 7,000 miles, and vessels in the direct trade between Australia and the Pacific Coasts may have the choice of routes going as well as coming; going, the distance to be sailed, on account of detour for the sake of winds, is about 7,500 miles; returning, that is, coming this way by the eastern route, the distance is 800 or 900 miles greater. With the exception of the N.E. trades on the passage from New South Wales or Victoria to California, the winds are fair, or may conveniently be made fair both ways. A good N.E. course can be made through the S.E. trades, and a N.N.W. course, on the average, through the N.E. trades. But these courses will not give easting enough for the California bound trader, and it therefore becomes a question for him to decide whether he will make up his easting in the variables South of the S.E. trades, or in the variables North of the N.E. trades, for in both of those systems of variables westerly winds prevail.

In coming out of the Victoria Ports go South of Van Diemen's Land, or through Bass Straits, as you have the winds and find it expedient.

Being South of Van Diemen's Land makes it convenient to pass South of New Zealand, if the wind be fair, as in the majority of cases it will be. Having passed South of New Zealand, steer for the parallel of 40° or 50° S., between the meridians of 150° and 140° W., thence for the Equator between 120° and 130° W., crossing by a North course, both the horse latitudes of the southern hemisphere and the equatorial doldrums; then run through the N.E.

trades as best you may, keeping a "rap full," and running up into the variables beyond the horse latitude calms of the northern hemisphere, if needs be, to complete your easting, and make your port.

If the winds be not fair for passing South of New Zealand, try Cook Straits in preference to passing to the North of New Ulster (North Island).

If you pass through Cook Straits, then stick here close to the eastward, and take the eastern passage. On this passage you should run down your easting pretty well before you get far enough to be bothered by the baffling winds of the horse latitudes South. If these come as low down as 30° or 40° S., stand North the moment you feel them, till you get the S.E. trades; then cross these and the N.E. trades, both as obliquely to the eastward as they will permit, with fore-topmast studding-sail set.

On this passage you will have finally to run down your easting when you get into the variables beyond the N.E. trades, and of course you will aim to reach the parallel of 38° or 40° N., or even a higher one North, to do this. How far you will go North depends somewhat on the distance you may be West of California when you lose the S.E. trades. If you be only a degree or two from the land, you will steer straight to your port without caring to get to the northward of it; but if you be ten or twenty degrees to the West of it, or even farther, then of course the distance to be run makes it an object to turn out of your way and go North in search of good winds.

Therefore the choice of routes on this voyage resolves itself into the answer to this question: Is it best to make easting between the parallels of 40° and 50° S., or about the parallel of 40° N.? If the former, then the eastern route is the route; if the latter, then the preference should be given to the western route.

I give preference to the eastern route especially, and decidedly when the winds at starting are favourable for the East course. I have no doubt but that, as a general rule, the winds by the eastern route, both variables and S.E. trades, are much more steady and reliable than they are by the western route. Moreover, the distance from the Victoria Ports, viâ South side of Van Diemen's Land and New Zealand, is not more than three or four hundred miles greater than it is by the most direct route that is practicable, and the chances of good winds by the eastern route will, in my opinion, amply make up for this increased distance.

It is proper for me to state here that I do not give these Australian sailing directions as directions that are founded on, or derived from, investigations into the routes actually pursued by vessels from Australia to California; but I give them as deductions drawn from the knowledge which I have acquired touching the general system of the winds and currents out upon the high seas.

The most difficult and uncertain parts of this passage will be in the time required to cross the three belts of calms, and to clear the winter fogs of

California. But for these, the eastern passage from Victoria to California would be one of the most certain passages in the world.

The passage between Australia and California should be made ordinarily in from 45 to 50 days; the passage to the East being rather the shorter; of course clipper ships will occasionally make the passage in 37 days.

BETWEEN AUSTRALIA AND CHINA.

The following is derived chiefly from an analysis by Captain Allen, Harbour Master at Newcastle, New South Wales, of the logs of various sailing vessels that have made passages during the years of 1869—1873, and collected by Staff-Commander T. H. Tizard, H.M.S. *Challenger*, 1874.

During the above years four different routes have been taken by ships bound from the province of New South Wales to China; three of these routes are to the eastward of New Guinea, and one (the well-known Torres Strait Route) passes to the westward of that great island.

These routes are herein styled respectively, the Eastern, the Middle, the Western, and Torres Strait Routes.

The description of the new route through the Louisiade Archipelago will be found on pages 940—945. It will, when better known, probably become much used, forming as it does a much shorter Western Route.

The Eastern Route follows a line from Newcastle (or from Sydney) to Norfolk Island, thence to Matthew Island, and North along the 171st meridian to 11° S., then N.N.W. to Pleasant Island, crossing the Equator in 166° E., and through the eastern part of the Caroline Islands to the ship's destination.

The Middle Route is from Newcastle (or Sydney) midway between Lord Howe Island and the Elizabeth Reef, to the D'Entrecasteaux Reefs off the N.W. extreme of New Caledonia, and thence between the Solomon and Santa Cruz Islands to the Equator, which is crossed in 159° E.; thence through the middle of the Caroline Islands, when a course may be shaped for the destined port.

The Western Route from Newcastle followed by these vessels is N.E. to the 157th meridian, and due North on that meridian to the latitude of the Pocklington Reef in 11° S., thence either to the north-westward between New Ireland and the Solomon Group, or to the northward through the Bougainville Strait, between Bougainville and Choiseul Islands, crossing the Equator in about 153° E.; from this position a straight course may be shaped for either Shanghai or Yokohama; but for Hong Kong the course is through the western part of the Caroline Islands, thence to the Balintang Channel.

The Torres Strait Route is also from Newcastle, N.E. to the 157th meridian, then North on that meridian to the latitude of the Mellish Reef, and N.W. for Bligh Entrance to Torres Strait. It has been taken by only one ship, the *England*, which made the passage to Hong Kong in 41 days, in the month of July.

Much depends on the sailing qualities of the vessel, but, as a general rule, ships leaving Australia in the months of January, February, or March for China or Japan should adopt the Middle Route, and may expect to make the passage in about 40 days; leaving in April, May, or June they should adopt the Western Route, and may expect to make the passage in about 36 days; leaving in July, August, or September they should, if they can reach Torres Strait before the end of August, take that route; and if not, either the Western or Middle Route, and may expect to make the passage viâ Torres Strait in 40 days, and by the other routes in 55 days: and, finally, ships leaving in October, November, and December should adopt the Middle Route, and may expect to make the passage in about 44 days.

AUSTRALIA.

The following are from the Australian Directories:—

Inner Route from Torres Strait to Sydney.—Vessels bound from India to Sydney have generally gone to the westward of Australia, and round Cape Leeuwin, which, according to some authorities, is by far the most safe and expeditious route; whilst others assert that the eastern route is practicable from November till February; and Mr. Hudson, who has had great experience in the western part of the Pacific, says the eastern passage from Singapore to Sydney may be made at all times of the year; but it does not appear that until H.M.S. *Bramble* tried the experiment in 1845, a passage was ever accomplished from Torres Strait to Sydney by the Inner Route. On that occasion the undertaking was commenced near Darnley Island, in the month of April, and prosecuted against the full force of the S.E. monsoon as far as Sandy Cape, when variable winds, and generally a southerly current near the land, rendered the concluding part of the voyage comparatively easy, the whole passage having been accomplished in 90 days.

On the second occasion the *Bramble* left Cape York for Sydney at the latter end of the month of November, when the winds were as much in her favour as against her, so that the passage to Sydney was performed in 40 days, exclusive of delays resulting from surveying operations.

Generally speaking, as already observed, it will be better, especially for a sailing vessel, to proceed from India to Sydney westward, by Cape Leeuwin; but being anywhere near the North coast of Australia, in the N.W. monsoon, from November to February or March, the Inner or Outer Route may be adopted with advantage.

From Sydney to Torres Strait.—The Outer Route is much more likely to interest most of the commanders of merchant vessels proceeding from Sydney to Torres Strait, whose chief object is generally to make a quick passage with the least amount of labour.

The Outer Route no doubt possesses these advantages; but it must be

borne in mind that the passage through the Great Barrier Reefs, from the Coral Sea into Torres Strait, is frequently attended with danger, and sometimes the loss of the vessel, nothwithstanding the recent surveys and the erection of the beacon on Raine Island. These disasters, however, would doubtless be less frequent were the Great N.E. Channel more used, as it may be mostly navigated by night, so that the time and labour saved by not being compelled to anchor so frequently as in the route by Raine Island, would more than compensate for the 90 miles, by which the former route exceeds the latter in distance.

The chief objection to the Great N.E. Channel seems at present, to arise from the approach to it by the *Cumberland's* track, from lat. 15° 30′ S., long. 152° E., having been less frequented than by that to Raine Island; but as the *Cumberland's* route has been partially traversed by H.M.S. *Herald*, and successfully followed by the ship *Medway* and other vessels, its navigation appears to be far less hazardous than making Raine Island or either of the adjacent passages through the Great Barrier Reefs.

Notwithstanding all that has been said in favour of the Inner Route, supported by the weighty authority of Capt. P. P. King, the Outer Route is unquestionably preferred by nearly all the merchant vessels bound from Sydney to Torres Strait, more especially since the survey of the Coral Sea.

See also pages 964—965.

The New Route through the Louisiade Archipelago for vessels proceeding to the northward of New Guinea, will be found described on pp. 944-5.

Bass Strait to Sydney.—Having passed Kent group, a N.E. by E. course will lead about 60 miles seaward of Cape Howe; but should it blow hard from the southward, a more easterly course should be steered, to avoid what would then be the dangerous lee shore, known as the Long Beach, which extends from Corner Inlet for 150 miles, or nearly to Cape Howe. From a known position eastward of Cape Howe, steer northward along the East coast for Port Jackson, bearing in mind that the current generally sets to the southward along the East coast at 20 to 60 miles from the land.

For Hobart and Sydney by the route South of Tasmania.—If bound for Hobart, or if the southern route be preferred for proceeding to Sydney, a ship running down her longitude through the Indian Ocean on the parallel of 38° or 39° S. as recommended, and having passed the meridian of 115° E., should, on reaching the meridian of 145° E., be far enough South to round Tasmania before making the land, in order to avoid falling in with its rocky western coast in the night, or from being caught on a lee shore by a S.W. gale.

From South of Tasmania to Sydney.—After rounding the South Cape, a ship bound to Sydney without touching at Hobart, should give a berth of at least 20 or 30 miles to Cape Pillar and the East coast of Tasmania, by which she will escape the baffling winds and calms which frequently perplex vessels inshore, while a steady breeze is blowing in the offing. This is more particularly

desirable in the summer, when easterly winds prevail, and a current is said to be experienced on the S.E. coast at 20 to 60 miles off shore, running to the N. by E. at the rate of three-quarters of a knot, while inshore it is running in the opposite direction, with nearly double that velocity. From a position at about 30 miles eastward of Cape Pillar, 350 miles on a North course will take a vessel to 15 miles eastward of Cape Howe, from whence proceed for Sydney as before directed.

AUSTRALIA AND NEW ZEALAND TO CAPE HORN.

The passage from Australia and New Zealand around Cape Horn to the Atlantic is governed by very different circumstances to that in the reverse direction. In the latter, the trade-winds and their corresponding currents would facilitate the passage, and offer insurmountable obstacles to that from West to East. The track, then, in a high latitude, becomes the best as it is the shortest, and the prevalent winds and currents in it are favourable.

Passing from this, the primary point in the question, it has been demonstrated, in the early part of this chapter, that the actually shortest track between these distant points leads to a very high latitude, unattainable to shipping; therefore the most advantageous route to be followed must be a combination of these circumstances.

Thus the shortest route, on a great circle, from Hobart to Cape Horn, or rather the Diego Ramirez Islands, reaches the lat. of 75° 30′ S., in long. 135° 50′ W. The course on leaving Storm Bay is S. by E. $\frac{3}{4}$ E. So that it would be in reality a better course, as to nearing the destination, if a ship were to steer due South from Van Diemen's Land until a proper parallel be attained, rather than bear to the E. by S. on a rhumb course. Any course between these two, therefore, will be advantageous.

From Sydney to Diego Ramirez the great circle course carries a ship 300 miles to the S.W. of New Zealand, and attains lat. 73°, in long. 130° 45′ W.

From New Zealand to Diego Ramirez the approximate great circle course becomes more practicable in the summer fall of the year. The track from Cook Strait, leads into the highest latitude, 66° 30′, longitude 117° 15′ W. The course on first leaving Cook Strait will be S.E. by S., and on nearing Diego Ramirez, N.E. $\frac{1}{4}$ E.

It will be thus evident that, as a general principle, it is quite out of the question that such high latitudes can be attained, and the shortest route pursued. Recourse must therefore be had to what has been denominated by Mr. Towson composite great circle sailing, and which will be readily understood to signify that the maximum latitude is to be attained by the shortest route in the direction of the port, and then the ship to be conducted along the

parallel selected, until she again cuts the great circle course leading to her destination.

Supposing the parallel of 55° to be that chosen, then the great circle track from Sydney cuts it in long. 165° or 166° E., to the southward of the Auckland Group, and this followed up brings the ship to the South extremity of America.

There is one conclusion to be derived from some voyages that far to the northward of a sea comparatively clear, there exist vast masses and barriers of ice of every description, which must have been drifted northward from the southern Polar Sea, to a parallel from which to the southward they never return; while the experience of others shows that in different seasons a very different amount of the floating dangers is met with. The reader is referred to what has been previously said in pages 1144 to 1153 on the subject.

The effect of the antarctic drift, as will be seen by previous remarks, is now clearly established. How far the breaking up of the winter collections of ice by the effect of the summer may be periodical, we have no means of determining; but it is most probable that the period best adapted for passing, as to daylight, through this high latitude, is that in which the greatest amount of ice-drifts are to be expected. It is also probable that, as the summer advances, the greater part of the floating masses of ice may have proceeded so far to the northward as to leave a comparatively free space between them and the perpetual icy barrier surrounding the South Pole.

Capt. Biscoe concludes the abstract of his log of this passage with the following remarks:—In the very high latitudes, when actually, as it were, *within* the ice, the winds were almost uniformly from the South, round by S.E. to E.N.E.; which, being *contrary* winds to a vessel in proceeding from West to East, he was inclined to recommend that future attempts of the same nature should be made in the opposite direction, viz., from East to West. Outside the ice, however, the winds were constantly westerly; and it may, therefore, admit of doubt, whether the convenience of having a fair wind at command, whenever required (as in the *Tula's* case), to run for shelter and repairs, be not of more importance than when its possession can seldom be of vital consequence, and may frequently lead to rashness and imprudence.

These remarks will demonstrate that too high a latitude, unless it be for a short distance, and with favourable circumstances, is not to be recommended, except to vessels properly equipped or on special service.

Perhaps the summer months are not the most favourable for sailing in high latitudes. The great and perhaps indispensable advantage, however, being the long days and comparative freedom from darkness, whereby the dangers are more easily seen and avoided than in winter, when the low altitude of the sun, and the shortness of the daylight, contract very much the chances of making a good passage.

It is thus evident that a ship to pass round Cape Horn must enter on a

parallel of latitude where inclement, though perhaps not boisterous weather is inevitable, and also she has the chances of meeting with it at any season, but more especially in the early part of the summer, January and February. Therefore, any ship which is not calculated to sustain some amount of buffeting from the floating ice should not attempt to combat with the passage in a high latitude. Yet much advantage is to be gained. Not only does the weather appear to be generally more moderate, but *outside* the ices the winds are generally favourable, and a speedy passage, conducted with a strict look-out, may be expected, and is not to be considered a very hazardous undertaking.

Opinions differ as to the proper parallel on which to make the easting. Some advocate that of 50°, among whom is Admiral FitzRoy, as quoted below; others, as Mr. Towson, on excellent authority, advise a much higher latitude. Mr. Towson's remarks, given on page 1150, *ante*, should be attentively considered. He there recommends from June to December, that the parallel of 57° should be preferred.

Admiral FitzRoy gives the following remarks on this in the second number of his Meteorological Papers, 1858, pages 33, 34 :—

In crossing the Pacific, toward the East, in southern latitudes, a ship should not go beyond 50° South till near Cape Horn, as there is usually much ice southward of that parallel, especially in the eastern part of the South Pacific; and occasionally it is met with some degrees further North, in autumn (February, March, and April), after long continuance of westerly gales.

A few hundred miles may be saved in distance out of about twelve thousand, by going into very high southern latitudes, but at the risk of encountering ice, and with the certainty of a very cold disagreeable climate. This applies equally to Australian passages by the Cape of Good Hope, where Great Circle Sailing has been carried too far by some ships.

Immediately near Cape Horn and the Falkland Islands ice seldom remains, as any that is drifted there (from the breaking up of great antarctic masses in the latter part of summer) is carried eastward by the current of *comparatively* warm water (40° to 50° Fahrenheit) that always sets around the great southern promontory, and not to the northward till beyond the Falklands, where the preponderance of winds, and the current, combine to drift them, melting gradually, even to as low a latitude occasionally as about the parallel of forty degrees.

In the long dark nights of an antarctic winter, when the moon is not nearly full, *Ice* (especially the low less visible floes which are not many feet above the surface of the water) is especially to be guarded against by the most vigilant look-out, and by keeping under manageable sail, in readiness to alter course instantly, if danger is suddenly reported. A navigator, of high repute in literature, especially nautical, once recommended, in a widely read publication, that seamen should round Cape Horn from the westward, not only under low and manageable sail, but with "yards braced up," to be ready for hauling on

a wind. He did not, however, explain how to act if ice should be seen close on the weather bow in such circumstances, or how the wild steerage of a ship would be obviated, while running free with her yards shut up.

In the summer of the southern seas there is so little night that ships may run with security, provided that (even in broad daylight) a good look-out ahead is invariably maintained under all circumstances. Foggy weather is comparatively rare, unless very far South.

The distance on the great circle between the S.W. cape of Van Diemen's Land and Cape Horn is 5,100 miles. The average length of the voyage (from 17 logs) from Melbourne to Cape Horn is 35 days: the distance sailed about 5,500 miles.

New Caledonia, &c., to Europe.

There are several questions in deciding on the best route from a port within the tropics in this longitude, as to whether it is best to go eastward or westward, the distances being about equal. These considerations induced Lieut. Franquet, commanding the French steamer *Coëtlegon*, to take the passage by the Cape of Good Hope, leaving New Caledonia in May. His arguments were that, having regard to the low power of his vessel, the crew, &c., having been long within the tropics, and that the winter route around Cape Horn, although it is available at *all* seasons, would take the ship into inclement and stormy latitudes, where injury and delay to the ship, and perhaps sickness among the crew, might more than counterbalance the advantages which a free wind throughout would give him.

Leaving Nouméa, New Caledonia, May 23rd (1865), they made for the Raine Island Entrance, thence through Torres Strait, and calling at St. Denis, Réunion, which they reached in 37 days, making good an average daily course of 176 miles, thence to Simon's Bay and Cherbourg, which they reached after a voyage of 103 days 7 hours, making a daily rate of 153 miles. Lieut. Franquet therefore considered that he had chosen the best course, as the ship and crew were brought home in perfect order, and one of three fast sailing frigates which left Nouméa a month before him, making the eastern passage, was 135 days at sea; and concludes that during the southern winter the route by Torres Strait and the Cape of Good Hope is the best for steamers and small sailing vessels.

We take the following, on the same subject, from the Australian Directory:—

Route to the Westward South of Australia.

Ships bound from Sydney to Europe or India may, from the 1st September to the 1st of April, proceed by the southern route through Bass Strait, or round Tasmania, easterly winds being found to prevail along the South coast

of Australia at that season, particularly in January, February, and March, when ships have made good passages to the westward, by keeping to the northward of 40° S., and have passed round Cape Leeuwin into the south-east trade wind, which is then found to extend farther South than during the winter months. In adopting this route, advantage must be taken of every favourable change of the wind, in order to make westing; and it is advisable not to approach too near the land, on account of the south-west gales which are often experienced, even in the summer, and the contrary currents, which run strongest in with the land. The prevalence of strong westerly gales renders the southern route *very difficult*, indeed, generally impracticable, for sailing vessels, in the winter, although the passage has been performed at that season by ships in good condition which sailed well; but the northern route, through Torres Strait, is preferred in the winter months.*

Australia and New Zealand to Cape Horn.

Port Phillip and Sydney to Cape Horn.—A vessel bound for Europe by way of Cape Horn, on leaving Port Phillip should, with a westerly wind, proceed through Bass Strait, and passing 3 miles southward of Kent Group, run out about E. by N., and having cleared Wright Rock, Endeavour Reef, and the Sisters Isles, steer for a position between the Snares and Auckland Isles, southward of New Zealand, in lat. 49° S., long. 165° E.

Westward of Tasmania.—If on leaving Port Phillip the wind should be inclined to blow from the East or N.E., it may be desirable to run out south-westward, between Cape Otway and King Island, and having passed the North end of the island, haul up about S.S.E., taking care, while proceeding along the West coast of Tasmania, to prepare for the prevailing westerly or south-westerly winds, when this coast becomes a dangerous lee shore. Having rounded the outlying dangers off the South coast of Tasmania, proceed for the position before mentioned, between the Snares and Auckland Isles.

From Sydney.—At all seasons, and from whatever quarter the wind may blow, it is advisable, on leaving Port Jackson, to proceed to the southward rather than to the North of New Zealand, as in the latter route a vessel's progress to the eastward would be probably impeded by adverse winds and currents.

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* Misapprehension appears to exist on the part of some foreign authorities, in regard to this paragraph, which makes it necessary to remark that it is not intended to recommend ships bound to Europe, to take the western route: for the route by Cape Horn *at all seasons and under all circumstances, has always been considered the shortest.* But as both ships of war and merchants ships frequently do proceed westward, from Australia to India, to the Cape of Good Hope, and Europe, the Directory would have been manifestly incomplete did it not point out the seasons when such passages could be made with most advantage.

Advantage, therefore, should be taken of the most favourable winds for either reaching the before-mentioned position, between the Snares and Auckland Islands; or, if baffled by southerly winds and favoured by fine weather, the passage through Cook Strait may be taken with advantage, especially in the spring and summer season.

From New Zealand Eastward to Cape Horn.—The course frequently pursued between the 50th and 60th parallels, and even in higher latitudes in this great extent of ocean, would, with a clear sea and favourable weather, doubtless ensure the quickest passage, as being the shorter distance; but experience has proved that at nearly all seasons of the year so much time is lost at night and in thick weather, and even serious danger incurred in avoiding the great quantities of ice met with in these higher latitudes, that a parallel even as far North as 47° has been adopted with advantage.* Between this latter parallel and that of 50°, it is believed the mariner will experience steadier winds, smoother water, absence of ice, and will probably make as short a passage, and certainly one in a more genial climate, and with more security than in a higher latitude.

A vessel pursuing the route suggested above should, from the position southward of the Snares, proceed eastward between the Antipodes and Bounty Isles, keeping the parallel recommended to about the meridian of 120° or 115° W., and then gradually incline to the southward, to round Diego Ramirez and Cape Horn in proceeding into the Atlantic Ocean.

It is worthy of remark, that between the parallels of 49° 50′ S. and 53° 0′ S., and from the long. of 172° 0′ E. to 162° 0′ W., seaweed has been daily observed.

New Zealand to Valparaiso.

From New Zealand (Cook Strait) the great circle tracks to Valparaiso or the ports of Chile appear to be especially advantageous, and they are particularly recommended to the attention of the mariner. They carry the ship far away to the southward from the rhumb track, and, it is probable, into a better system of winds than will be found on that parallel.

On quitting Port Nicholson for Valparaiso, the direct course is about S. 51° E., *true*, and passes through lat. 45° 50′, on the meridian of the Chatham Islands,

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* Captain Gill, late commander of the ship *Monarch*, who made sixteen successful voyages from Australia round Cape Horn, at first adopted the route between the parallels of 52° and 56° S., but so much time was lost in heaving to at night and in thick weather, to avoid the great quantities of ice he met with, that he afterwards preferred the parallel of 47° S. for making his easting. He experienced on this parallel steadier winds, smoother water, and was less obstructed by ice, and considered that he made his passage in much less time, and with much more comfort to all on board, than on a more southern parallel.

that is, about 100 miles to the southward of the group. Gradually turning more to the East it attains the maximum lat. 54°, in about long. 134° W. Arrived off the American coast, on the parallel of Concepcion, the ship will be about 175 miles distant, and sailing N. 47° E. This course, it will be seen, is in the direct drift of the Peruvian current alluded to, and, at all events during the latter portion of the route, the winds may be expected to be favourable for the port. So that by taking the higher latitude, rather than sailing on the rhumb course, it is more than probable that the winds throughout may be steady, more or less, from the western quarters, and the limits between the regular trade winds and the system of N.W. winds which predominate to the southward of them, are subject to variable, and at times very variable, gales.

If the parallel of 54° should be considered too high a latitude to be attained, though the distance to be gone over within some distance of it is not very great, and that of 50° be preferred, by using the composite great circle track, this parallel will be attained from Cook Strait in about long. 165° W., and, by sailing along this parallel as far as long. 104° W., the great circle course is again intersected, and the easterly course will then be changed to N. 66° E. If lat. 52° should be preferred, the great circle course cuts it in long. 156° 30′ W. and 112° 30′ W.

The rhumb course between Cook Strait and Valparaiso is about E. 5° 30′ N.; and one great advantage in the great circle track is, that it offers such a wide range of ocean in which a shorter passage than on the rhumb can be made; for, should a ship sail anything to the East of S.E. by E., she will be nearing her port more than if she were to take the E. ½ N. course. Or even should she steer considerably to the South of S.E. by E. on leaving Cook Strait, supposing it were practicable and advisable, she would not commence a more really circuitous route than that on the rhumb.

From Sydney to Lima the same track might be nearly followed, as it certainly appears to be the best course to pursue to pass between the islands of New Zealand, through Cook Strait, and then by the shortest (or great circle) course to the parallel of 35° S., in long. 85° W. This point will be somewhere about the southern verge of the trade wind, and the port will then bear N. 17° E., which a ship may expect to lay up to in crossing the S.E. trade. The great circle course from Cook Strait is first S. 57° 20′ E., and attains its maximum latitude 51°, in longitude 141° W. Now this course, from Cook Strait to lat. 35° S. and 85° W., carries the ship to the southward of the space where the wind is variable, and certainly stormy at one period of the year.

Panama to Australia, Etc.

This voyage has now become of considerable importance in the steam communication between the Atlantic ports and those of Australia. The first steam voyage there was made by the *Golden Age*, American paddle-wheel steamer, 3,000 tons, 700 horse-power. She left Sydney May 12th, 1854; on the 24th, entered Papeite in Tahiti to coal; left there on the 29th, and reached Panama on June 18th; the total distance run was 7,862 miles in 33 days; so that England might have been reached in 54 days.

But for the convenience of coaling at Tahiti, the *Golden Age* went considerably out of her way, and this, too, through a region of contrary winds and currents, which would be favourable for the return voyage, and would therefore be as well carried out over this route, or better if to the northward of the Low Archipelago and the Fijis, and thence S.W. to the destination. The great circle uniting these places, as will be seen by the chart illustrating the passages, passes to the south-eastward clear of the dangerous Low Archipelago, and near to Rapa or Oparo and the Gambier Islands, described on pages 519—522 and 601—603. It is surprising that this latter group, lying to windward of all the dangers of the Western Pacific, possessing, moreover, almost exclusively, the advantage of a water supply, and having tolerable anchorage, should not have been suggested at home as a midway post on this Trans-Pacific route before the French Protectorate of Tahiti extended their line, so as to include it just prior to the establishment of the Mail Packet Company. When it was found afterwards that Rapa would be chosen, the same nation discovered that that island *ought* also to be included.

PASSAGES BETWEEN THE PACIFIC ISLANDS.

Valparaiso to the Marquesas.—Valparaiso lies to the southward of the parallel where, in the offing, the easterly winds may be expected to be found; therefore a course to the N.W. is to be recommended in the first part of the passage. To aid this portion of the voyage, the northerly Peruvian current will be found serviceable, and farther to the West is that counter current (if it be a permanent drift?) found by the Prussian ship *Mentor*, and hence called *Mentor's Counter Current* (see page 1125). The existence of this current is also, in some degree, confirmed by Capt. Bruce, who, in August, 1837, found a strong N.E. current near to St. Ambrose Island.

From the Coast of Chile or Peru to the Sandwich, Society, Marquesas, and Pitcairn Islands, by Mr. G. Biddlecombe, Master of H.M.S. *Actæon*:—On leaving the coast, run into the S.E. trade wind, or in lat. 20° S., as soon as possible, where you will generally have strong easterly winds and fine weather;

you may then stand to the S.W., when you should steer for it, taking care not to get to the westward of the island, as the current runs strongly to the westward, owing to the prevailing easterly wind, except about December and January, when a northerly or N.W. gale sometimes sets in.

From Pitcairn Island you will be enabled to shape a course for the Marquesas, taking care then to keep to the eastward, as the S.E. or S.S.E. trade blows through the islands.

On leaving the Marquesas, cross the Equator, if possible to the eastward of 145° W., as you will then be enabled to steer for Hawaii, or a degree to the eastward of it, if you should fall in with the N.E. trade early, although you seldom meet it till you are in latitude 10° N. The variable winds are generally westerly, and the current runs with the wind; but if you get easterly variables you may expect to be set a long way to the westward, as the currents run more strongly in that direction than in any other. You should, therefore, cross the line well to the eastward, to ensure your fetching to windward of Hawaii. In passing Hawaii, do not go nearer than 40 miles to it, as vessels often get becalmed for many days together under the land.

On leaving the Sandwich Islands, you should stand South till in the latitude of the southern part of Hawaii, when you should haul your wind to cross the line, if possible, in the longitude of Tahiti, as the S.E. trade breaks you off when you first make it, and then you do not fetch it within several degrees. It is tedious to get to the eastward in the latitude of Tahiti, owing to the strong westerly current; therefore you should lose no chance of preserving your easting.

After leaving the Society Islands for Peru or Chile, you should stand to the southward into the latitude of 34° or 35° S., where you will in general find westerly winds which will take you to the coast.

A good passage may be made from Tahiti to Pitcairn by running through the southern part of the Low Archipelago, taking great care at night.

"The steamboat passage will certainly be made *from Honolulu to Callao* by coming down the trades 'full and bye' direct with the 'doldrums,' then steam to the East, and cut the current (see p. 1133), continue on till near the Galapagos, then cut it again and head strait for port. Care must be taken to keep a reasonable distance from the path of the current, and so keep out of its influence. For the homeward run, watch the thermometer and keep in the current."—*Capt. J. McKirdy*, ss. *Peruvia*.

Sandwich Islands to Tahiti.—There is great difficulty in making this passage across the trades. The whalers and all others speak with great doubt of fetching Tahiti from the Sandwich Islands. Capt. Bruce says that a vessel should keep to the northward until she gets a start of wind before bearing for her destination. In his passage between them in November, 1837, he had no variables near the line in coming South, and never could make easting on either tack, though he endeavoured by every means to do so.

In the passage from *Tahiti to Hawaii*, Captain Beechey says:—From the time we passed Maiatea we endeavoured to get to the eastward, and to cross the Equator in about 150° West longitude, so that, when we met the N.E. trade wind we might be well to windward. There is, otherwise, some difficulty in rounding Hawaii, which should be done about 40 miles to the eastward to ensure the breeze. The passage between the Society and Sandwich Islands routes differs from a navigation between the same parallels in the Atlantic, in the former being exempt from the long calms which sometimes prevail about the Equator, and in the S.E. trade being more easterly. The westerly current is much the same in both; and, if not attended to in the Pacific, will carry a ship so far to leeward, that by the time she reaches the parallel of the Sandwich Islands she will be a long way to westward, and have much difficulty in beating up to them.

Australia to the Fiji Islands.—The following is by Capt. von Reibnitz, of the German frigate *Arcona* :—For the passage *from Sydney to the Fiji Islands*, precise directions cannot be given, on account of the irregularity of the winds. Proceed to the eastward South of the parallel of 30° S., and steer so as to cross this parallel near the 173rd meridian, to make sure of reaching Fiji with the trade wind, often very strong and easterly in these latitudes. The *Arcona* crossed 30° S. in about 174° E., on May 2nd, 1874, and arrived at Levuka 4½ days afterwards, 25 days from Sydney. The passage was much lengthened by easterly winds. A more northerly route would be still more unfavourable. The auxiliary screw steamer *Duke of Edinburgh* left Sydney two days before the *Arcona*, and took the route North of lat. 30°, and arrived at Levuka 24 hours after the *Arcona.—Hydrographische Mittheilungen*, 1874.

Sailing vessels bound for Suva, during the trade wind months, from New Zealand or the Australian colonies, should endeavour to make sufficient easting to enable them to pass to windward of the Astrolabe Reefs, and thus obtain a commanding position for bearing down on the port. Steam vessels can make Mount Washington, and passing close to Cape Washington steer through the Kandavu Passage on a straight course for Suva. With the wind North of East, which is not unfrequent, sailing vessels cannot lay through the passage. In working to windward, preference should be given to the South side of the passage. After passing the North Astrolabe Reef, a course should be steered for Na Komba Levu Mountain, thus keeping a little to windward, and the reef followed down to the entrance of the harbour. On leaving Suva for the Australian colonies, the Kandavu Passage is the best route for all classes of ships, Mount Washington affording an excellent point of departure.

CONCLUSION.

In thus terminating our descriptions of the geographical features, the phenomena, and other topics interesting to the navigator, but few words are necessary as to the future improvement of the hydrography of the GREAT SOUTH SEA. Many or most of its particulars are placed on a much more satisfactory basis than could have been done in former years. The surveys of our own Government, the diligence and skill of many mercantile commanders, the various examinations and notices given by foreign officers, have left but few particulars untouched, but few areas unexplored.

Still our directions and charts cannot be considered as perfect. In all that has been written in this volume we cannot pronounce it to be beyond criticism, or incapable of improvement, from individual observation. Whatever may be found wanting or erroneous will be most gladly corrected and acknowledged if the shortcomings of our work be pointed out.

To all that has been said upon any of the topics included in this work, we feel bound to recommend that the sailor's palladium, CAUTION, should be added. Lurking and insidious dangers may yet be encountered even in the best known and most closely examined parts of the great ocean. How much more, then, may such exist in the great area of waters, which so much exceeds in its ratio the size of the lands which only are capable of description. To record these, if met with, to amend what may be defective, will then not only be benefit to all who use this work in these distant seas, but will be conferring much obligation on the editor.

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